THE MODEL ENGINEER

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The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

12TH JULY 1951 VOL. 105 NO. 2616

SMOKE RINGS

Our Cover Picture

● THIS WEEK'S photograph is from one taken at Mombasa station, East African Railways, by Mr. W. R. Finch, who is a member of the North London Ship Model Society. The engine is one of the large 2-8-2 type at the head of the Nairobi mail train, a train which is usually hauled by one of the Garratt-type engines. These 2-8-2 type engines, or " Mikados," are very large for the gauge of 3 ft. 6 in., like all modern locomotive power on the principal railways of Africa, with the possible exception of Egypt where the British gauge of 4 ft. 8½ in. is used and the locomotives follow British practice to a large extent.

Closing Date for " M.E." Exhibition Competitions

● READERS ARE advised that the closing date for competition entries in THE MODEL ENGINEER Exhibition is July 16th.

Club secretaries should remind their members to send in their forms and also to make nominations for the Club Team Competition to the Exhibition Manager at 23, Great Queen Street, London, W.C.2.

Special Facilities at " The Model Engineer " Exhibition

● ARRANGEMENTS HAVE been made whereby organised parties travelling overnight to London to visit THE MODEL ENGINEER Exhibition and Festival of Britain may be accommodated at the New Horticultural Hall for breakfast and a preview of the models. Those wishing to take advantage of this offer should notify the Exhibition Manager at 23, Great Queen Street, London, W.C.2.

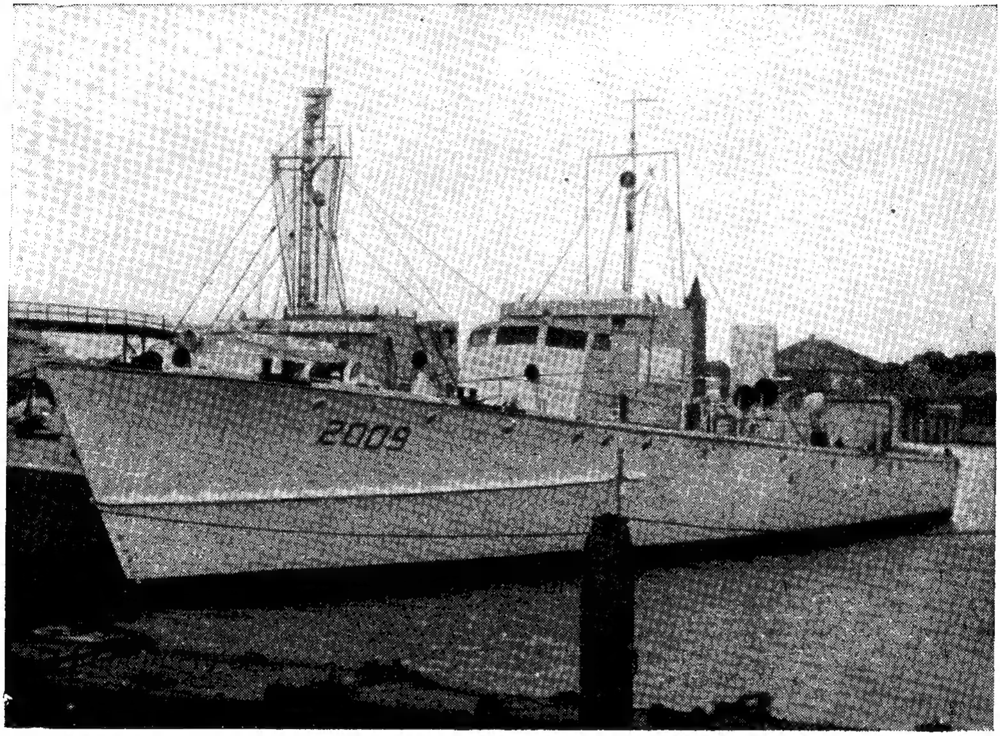
Municipal Museum, Newcastle-upon-Tyne

● THE LATE Capt. E. W. Swan, former curator of the Municipal Museum of Science and Industry, Newcastle-upon-Tyne, was well known to us and to many of our readers, not only personally but also on account of the very good work that he did in the course of his duties. Largely as a result of his efforts and enthusiasm, the Museum contains a collection of historical engineering and scientific material which is second to none in the world, and none of our readers who may be visiting Newcastle should fail to see it.

Mr. W. H. Davis, M.I.C.E., the present curator, is also an old friend of ours and of the " M.E." The last time we paid a visit to the Museum, we had the great pleasure to be in the company of both gentlemen, and we have not the slightest hesitation in stating that the good work there is being carried on with the same energy, enthusiasm, and even affection, as ever. Locomotives and railways figure prominently among the exhibits, largely represented by excellent and interesting models. Mr. Davis is, himself, a keen locomotive enthusiast with a wide knowledge of the history of the subject.

Gas Turbine Progress

● ABOUT FOUR years ago, we were privileged to take a trip aboard the first marine craft to be fitted with gas turbine propulsion, namely the Motor Gun Boat 2009 (now reclassified as Motor Torpedo Boat 5559), and the trials of this boat were fully described in the issue of THE MODEL ENGINEER of October 2nd, 1947. The plant originally fitted to this boat is now in the South Bank Exhibition, but a similar plant has given very satisfactory results over some 500 hours working trials, and both larger and smaller plants are being developed. One of the smallest, fitted to a naval harbour launch, has recently been demonstrated in the Thames in connection with the Festival of Britain, and once again, we have had the privilege of going aboard this craft, and witnessing tests.



The first gas turbine-propelled marine craft in the world: MGB 2009 (now MTB 5559)

Few modern inventions have progressed more rapidly, or had more far-reaching effects in the realm of power development, than the gas turbine, which, although by no means new in conception, has existed as a practical form of motive power for little more than a decade. In that short time, it has practically revolutionised aircraft propulsion, and has also been successfully applied to marine, locomotive and stationary work. The first gas turbine locomotive was not of British construction, but successful demonstrations of the gas turbine have taken place on British Railways, and considerable research work is now in progress with this form of motive power. As to the land development of the gas turbine, many well-known engineering firms in this country have contributed to its rapid progress. Generating plants up to 2,500 kW have been successfully constructed, and much larger plants are now under construction, or undergoing bench tests.

Midland Railway Relics Wanted

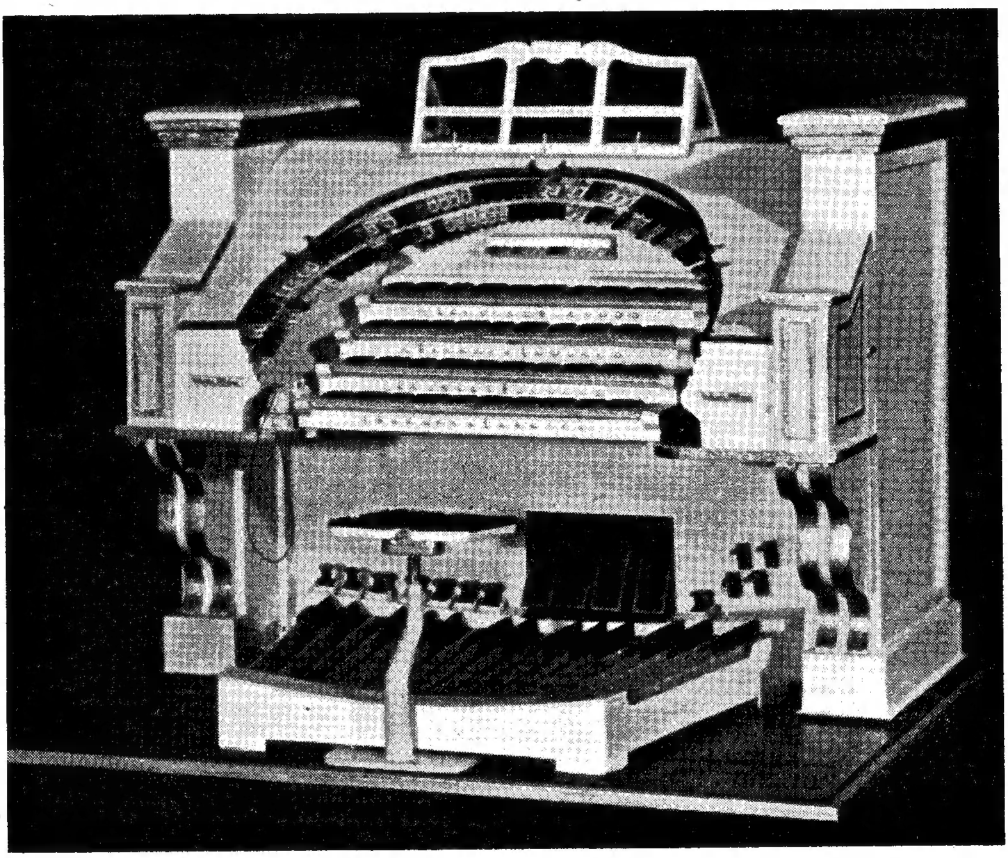
● HANSONS LTD., Brewers, Kimberley, near Nottingham, are the owners of the Sun Inn at Eastwood, which is of great historical interest by reason of the fact that on August 16th, 1832, a group of local coal-owners met there to discuss and approve a plan for constructing a railway between Mansfield and Pinxton. On the following October 4th, a special meeting decided that the line be extended from Pinxton to Leicester, to provide rail connection from Mansfield to Leicester. Eventually, this line was extended and became the Midland Counties Railway; later still, by steady growth through new construction and amalgamation, the concern became the Midland Railway with through communication to London.

In view of this, Hansons are anxious to acquire any relics, old pictures or documents associated with the early days of the Midland Railway. A photograph, drawing or engraving of the first M.R. locomotive would be especially welcome; or even a model, if such could be found. Does any reader know of the existence of such things!

A Model Organ Console

by M. G. Brewer

EVER since I can remember I have always been interested in the " King of Instruments " and about three years ago it occurred to me that an organ console would prove a good subject for modelling. I felt that a model of this kind would be rather uncommon and to a certain extent " out of the rut."



After having given the matter much thought I decided upon a theatre organ, for this type of console is much more colourful than that of the average church or " straight " organ.

I spoke to my very good friend, Ray Baines, who was at that time resident organist at a local cinema. He allowed me to examine the console of the organ and I spent a couple of hours measuring up and taking notes, etc. From these measurements and notes my first model console was born. The scale was very small, the base platform being only 3 in. square. It was also rather crude compared with my present standards. However, I built more of these small models and my standard gradually began to show signs of improvement.

When I had completed 11 of these small consoles I decided to increase my scale to one-twelfth and in about 40 working hours I built a model which was based on the console of the original B.B.C. theatre organ, an instrument which was acknowledged by many to be one of the finest unit organs in existence. The model has four manuals and pedals and 231 stop-keys, and has earned much praise from many people including Mr. J. I. Taylor, of the John Compton Organ Company, who built the full-size instrument.

The model described in the previous paragraph was completed in July, 1949, and I decided that my next model should be larger still. A scale of

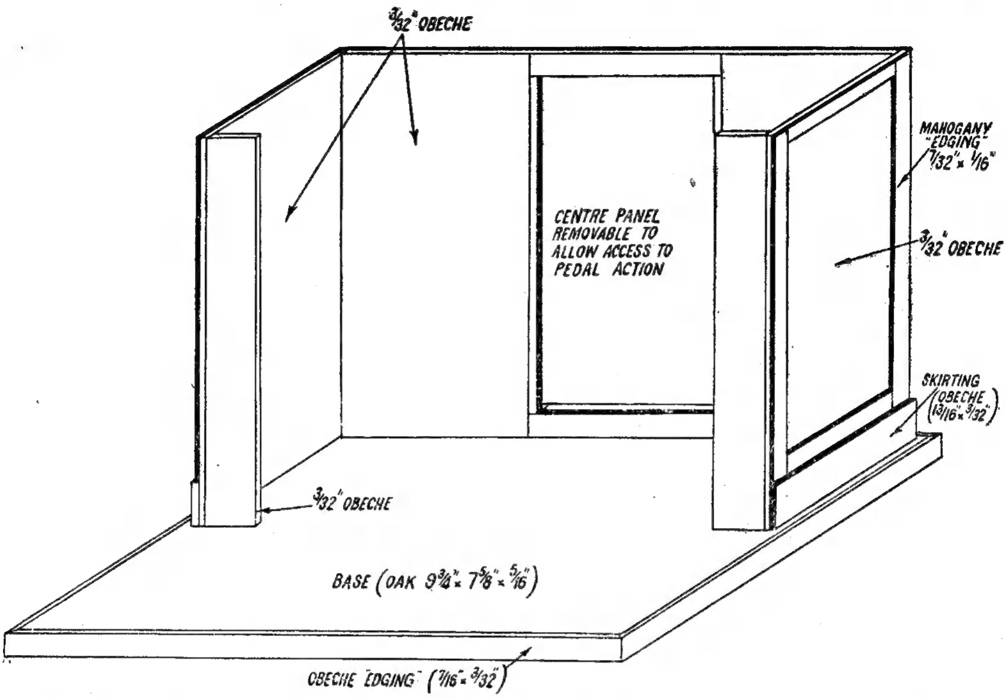
one-ninth was decided upon, the console this time to be of the type built by Wurlitzer, and often referred to by members of the cinema-going public as the "mighty Wurlitzer."

The Wurlitzer console is usually very ornate and very beautiful. Anyone who has seen the Wurlitzer at the Trocadero, Elephant and Castle, will know what I mean. To return to my subject, however, whilst I was spending a few days at Chatham, the manager of the Ritz kindly allowed me to examine the Wurlitzer installed in that cinema. It was not exactly the type of console that I wished to model, but I examined it carefully, for although the external details differed somewhat from the one I had in mind, many other details, such as the design of the pedal clavier, manual bed, stop-keys, etc., are common to most Wurlitzers. This is also true of other organ builders.

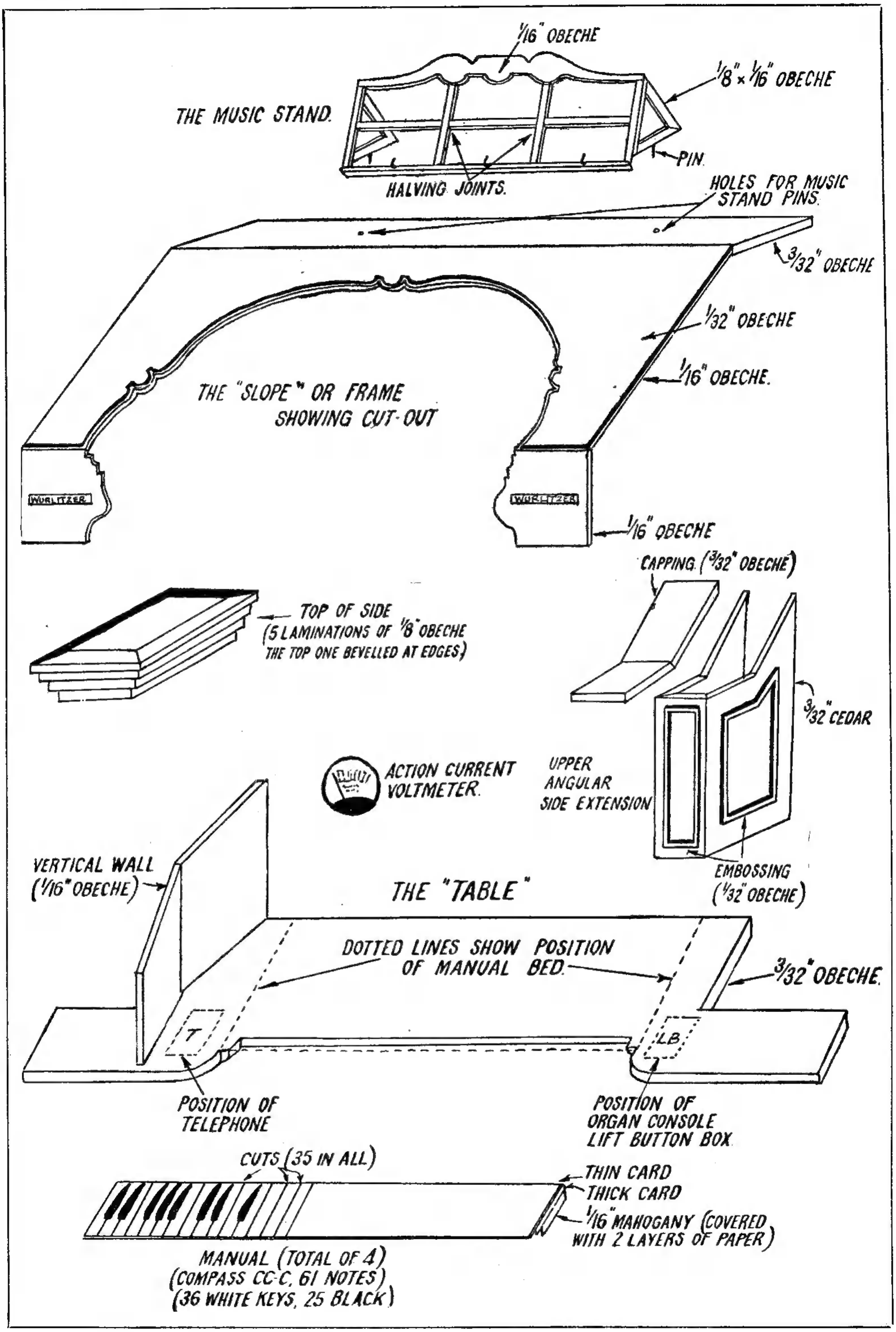
I had set my heart on the console of an organ of about 18 units (a unit being an extended rank of pipes) four manuals with thumb pistons, pedal clavier, toe pistons and effects pedals, etc. Ray Baines loaned to me a book which showed a number of pictures of Wurlitzer consoles from various angles. None of these photographs, however, was really good from the modelling point of view and I at once realised that, to a certain extent, I should have to work "blind."

First and foremost I had to find a suitable piece of timber to form the base platform. The wood had to be absolutely flat, well seasoned and showing no tendency to warp. One can well imagine what the result would have been had the base warped after the structure had been built upon it! After much searching I managed to find a piece of oak $\frac{5}{16}$ in. thick which suited my purpose very well, and from this the base was made to a measurement of $9\frac{3}{4}$ in. × $7\frac{5}{8}$ in. It was then "edged" with $\frac{7}{16}$ in. × 3/32 in. obeche to give it a little extra height, and work then began on the console proper.

The dimensions of the console were drawn on the base and a skirting of 3/32-in. obeche,



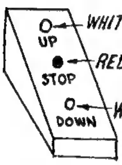
$\frac{13}{16}$ in. high, was firmly glued down to form the foundation for the sides and back of the console. The sides, of 3/32-in. obeche, $3\frac{1}{4}$ in. wide and $6\frac{1}{2}$ in. high, were then glued to the base and skirting, hard up against the *inside* of the skirting. They were then checked to ensure that they were absolutely vertical. The back was then erected in the same way as the sides and forming three equal panels, the centre panel being made removable. The sides and back were then "edged" with $\frac{1}{16}$ in. mahogany, 7/32 in. wide, to impart a panelled effect. The pieces which form the depth of the sides were then attached, together with the small pieces of skirting at the bottom. Obeche of 3/32 in. thickness was used. The vertical bulkhead of $\frac{1}{16}$-in. mahogany at the front of the pedal board was then cut with openings for the expression and effects pedals, and installed. At this point the "table" on which the manual bed rests was cut to the required shape from 3/32-in. obeche and glued in position. The flat top of the console (3/32-in. obeche) was then fitted and another piece of $\frac{1}{16}$-in. mahogany was made to fit vertically between the "table" and the top. This formed the bulkhead against which the manuals were to fit. Then the


1/16" OBECHE
1/8" × 1/16" OBECHE
THE MUSIC STAND
PIN
HALVING JOINTS.
HOLES FOR MUSIC STAND PINS.
3/32" OBECHE
1/32" OBECHE
1/16" OBECHE.
THE "SLOPE" OR FRAME SHOWING CUT-OUT
WURLITZER
WURLITZER
1/16" OBECHE
CAPPING (3/32" OBECHE)
TOP OF SIDE (5 LAMINATIONS OF 1/8" OBECHE THE TOP ONE BEVELLED AT EDGES)
3/32" CEDAR
ACTION CURRENT VOLTMETER.
UPPER ANGULAR SIDE EXTENSION
EMBOSSING (1/32" OBECHE)
VERTICAL WALL (1/16" OBECHE)
THE "TABLE"
DOTTED LINES SHOW POSITION OF MANUAL BED.
3/32" OBECHE.
T
LB
POSITION OF TELEPHONE
POSITION OF ORGAN CONSOLE LIFT BUTTON BOX
CUTS (35 IN ALL)
THIN CARD
THICK CARD
1/16" MAHOGANY (COVERED WITH 2 LAYERS OF PAPER)
MANUAL (TOTAL OF 4) (COMPASS CC-C, 61 NOTES) (36 WHITE KEYS, 25 BLACK)

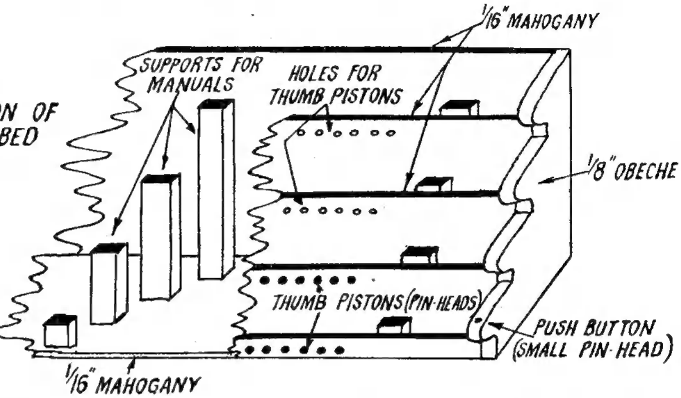
lower curved extensions at the front of the sides were carved. They consist of sandwiches of 3/32-in. obeche between two ¼ in. pieces of the same wood, and are glued to the front of the sides, to the skirting at the bottom and to the underside of the "table." The angular upper extensions at the front of the sides were then built of 3/32 in. cedar with 3/32-in. obeche capping and fitted so that on looking at the front of the console they appeared to be an upper continuation of the curved lower portions. A glance at the photographs will, I hope, make this clear.

side of the "slope" and the upper surface of the "table" were made from $\frac{1}{16}$-in. obeche and by a process of trial and error were gradually made to fit correctly. The front pieces on which the name "Wurlitzer" appears were also made from $\frac{1}{16}$-in. obeche. Apart from the manuals and one or two other small embellishments, the upper half of the console was now complete and attention was focussed on the lower half where much still remained to be done.

Work on the pedal clavier promised to create a headache, so I decided to tackle it first. The



ORGAN CONSOLE LIFT BUTTON BOX.



CONSTRUCTION OF MANUAL BED

The stop-key beds had to be an exact semicircle and these were quite simple to make, being cut from pieces of ⅛-in. obeche. Now a real piece of hard work had to be done. The cut-out of the "slope" of the console consists of a series of four arcs (two large and two small), which are arranged around and above the semicircular stop-key beds. The making of this particular portion was not so easy as it would lead one to believe and it was only at the third attempt that I got it absolutely correct and to my liking. The "slope" was made from $\frac{1}{16}$-in. obeche.

The stop-keys themselves were now made from 1/32-in. obeche. Each one is ½ in. long (to allow enough tail for attachment to the bed), ⅜ in. wide, with a slight taper and rounded at one end. They were then painted—white for flue stops, red for reed stops, yellow for certain stops of string tone, and black for couplers. The lettering on the white, red and yellow stop-keys was done with a mapping pen and black indian ink, and the lettering on the black ones was executed with a similar pen charged with white ink. This part of the job was very tedious.

There are 134 stop-keys and the fitting of them was quite a difficult task. It will be obvious that in a job of this type, each key has to be set at a different angle to its immediate neighbour and owing to the semicircular shape of the stop-key beds all the centre lines of the stop-keys must point towards the centre of the circle of which the bed is one half. The two rows of stop-keys were then fitted into their respective beds, and the two beds glued together and in turn glued to the underside of the "slope." The complete section was then fitted into the console.

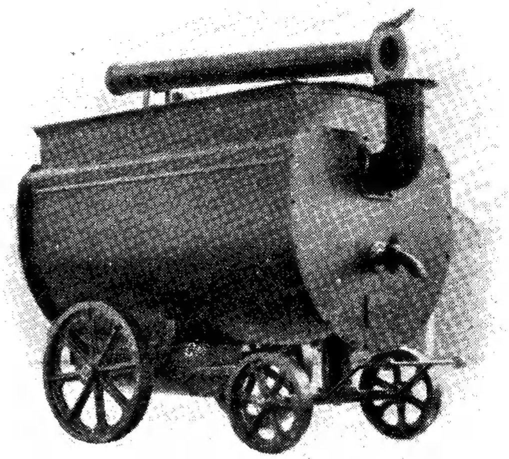
The vertical walls which fit between the under-

position of the back and sides had been drawn on the base platform at the commencement of the building. They were duly cut and shaped from $\frac{1}{16}$-in. obeche and glued down in their correct positions. The pedal board had to be both concave and radiating with a compass of 32 notes (CCC-G). The distance across the front of the clavier is 6 in. and across the back 4½ in. The pedals themselves were made from 3/32-in. cedar and a small hole was bored at the rear end of each. They were then threaded in the correct sequence on to a piece of soft wire which, when arranged in position, would stretch across the rear of the pedal board. During this threading process, small wooden separators were added between the pedals to keep each one at the correct distance from its neighbour. Much to my surprise, this part of the job came right at the the first attempt! It was now necessary to work on the front of the pedal board where the pedals entered the console. Here again I came up against the problem of angles. Owing to the radiation of the pedal board, each pedal had to enter at a different angle and the separators had to be fashioned individually and with enough play to allow for the up and down movement of the pedals. The job was completed to the accompaniment of a few pints of blood, tears and sweat and some bad words to boot. The curved portion which fits at the front of the pedal board *above* the pedals and *below* the expression pedals was then made from three laminations of $\frac{1}{16}$-in. obeche and fitted into place. I then strung a thin rubber band to the forward end of each pedal *inside* the console (the centre panel at the back of the console, mentioned earlier, was made detachable to allow this to be done).

(*To be continued*)

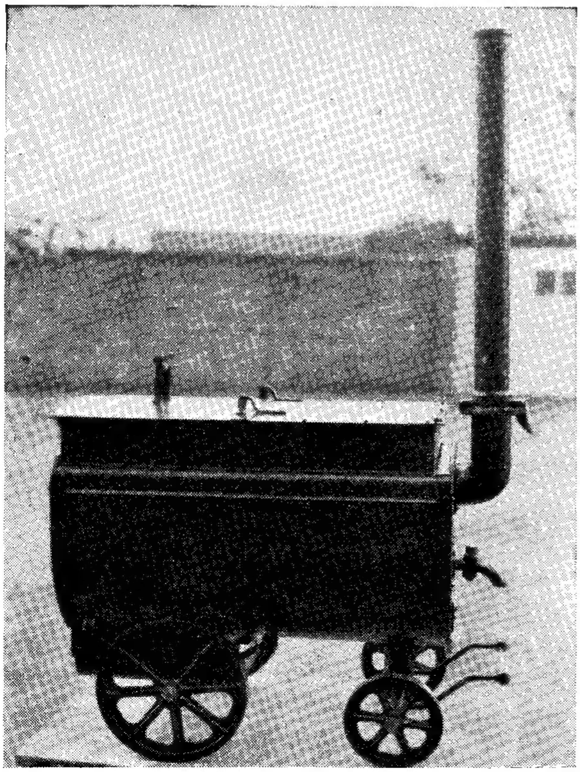
Another Unusual Model

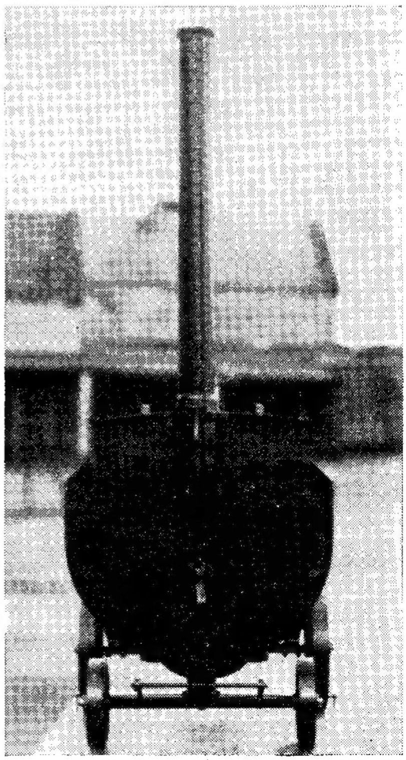
by J. Handel



AFTER making the model of the Phoenix-Edwards spreader described in the pages of a past issue of THE MODEL ENGINEER, I decided to fulfil a long-felt wish to build a model of one of the old time tar boilers made by the same firm. Photographs, some 30 years old, and outline drawings of the original were obtained and many hours were spent, watchglass in eye, deciding where the original was bolted together and where riveted. Eventually, it was decided that we were well enough acquainted to make a start on a quarter full-size model, and after debating whether to fabricate the wheels or faithfully to follow the "big chap," I made patterns and had the wheels cast. The original has cast-iron wheels, but in the interest of clean castings those on the model were cast in aluminium. Axles were made up of $\frac{1}{2}$ in. square steel, the rear one which passes round the front of the firebox being forged to shape.

(*Continued on page* 43)

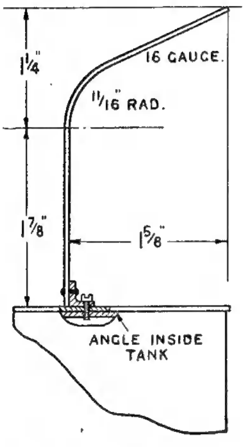




"L.B.S.C.'s" Beginners' Corner

Cab and Weatherboard for "Tich"

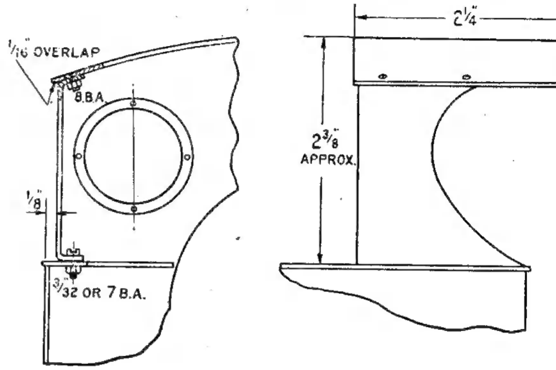
AFTER the exercise our beginner friends have had on the platework in the side tanks, the cab, or weatherboard, whichever you desire, and the bunker, should present not the slightest difficulty. When dealing with the boiler fittings in the issue of March 8th last, I drew in the outline of both a weatherboard for the small-boilered engine, and a short cab front for the larger-boilered one. Look up this issue for full views and dimensions. Accompanying these notes are some supplementary illustrations and dimensions to complete this part of the business. The specifications call for a plain weatherboard for the smaller job, and a cab for the larger; but there is not the slightest objection to swapping one for the other, in a manner of speaking. The only difference in the construction, would be to make the arch-shaped curve at the bottom to suit the different diameter of the boiler.



How to fix weatherboard

Weatherboard

Let's deal with the weatherboard first. This will require a piece of 16-gauge sheet metal; any kind will do, even aluminium, as there is nothing to be soldered to it. It should measure 4¼ in. × 5¼ in. The reason for using 16-gauge metal is that the weatherboard has to stand up by its own unaided efforts; there are no side pieces, nor roof, to give it any moral or physical support. First of all, cut out the window openings. These are 1¼ in. square, with rounded corners, and are located ⅜ in. from the sides, and ½ in. from the bottom. Mark them out carefully, then cut them by the same process as described for cutting out the firehole openings in the backhead, and back sheet of the firebox; another chance to test your acquired knowledge. Tip: if you have a metal-piercing saw—just a glorified fretsaw—drill a 7/32-in. hole at each corner of the marked-out space; then saw from one hole to the next, until the piece comes out. Trim up with a file, and there are your window openings with nicely-rounded corners. It's ever so easy! Whilst on this job, cut out two similar openings



How to fix cab

in another piece of metal, a little thinner, say 20-gauge, for the window frames. If brass is used, the window frames can be polished; many of the old-time contractors' engines were kept in spotless condition by their drivers and firemen. Cut away the metal around the openings, to within ⅛ in. of the holes, leaving two rectangular frames with rounded corners.

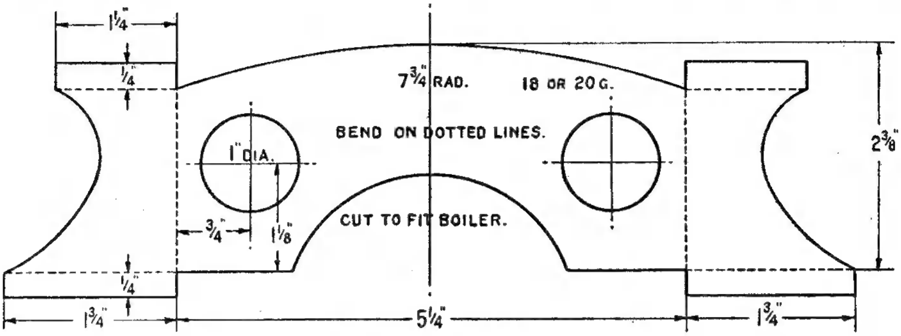
A Template Helps

The next item is to cut out the arch-shaped opening that fits over the boiler; and the easiest way to get a perfect fit, is to make a template from a piece of thin cardboard or stout paper, by aid of the domestic scissors. Scribe a circle on it, 2½ in. diameter, with a pair of pencil compasses; draw a line through the middle, then at ½ in. down the line, measuring from the edge of the circle, scribe another line at right-angles to the centre line. Cut across this, then cut out the segment of the circle left on the card or paper. This should fit exactly over the smaller boiler, the straight part of it resting on top of the tank at each side. If it doesn't, you'll see at a glance where to operate with the scissors, to get a perfect fit. When you have it, lay the card or paper on the piece of metal, with the straight part each side of the arch, flush with the 5¼ in. edge, and exactly in the middle. Run your scriber around the arch, and cut out the marked piece with saw and file; it should fit exactly over the boiler,

and no metal will be wasted. Then, at $1\frac{7}{8}$ in. from the bottom, bend over the top of the weatherboard to the angle shown. Clamp it in the bench vice alongside a piece of 1 in. round rod, and finger pressure on the projecting part, will give you a perfect bend, without a trace of kinking. Round off the top corners, with snips and file, to approximately $\frac{7}{8}$ in. radius.

Rivet a piece of $\frac{1}{4}$ in. $\times$ $\frac{1}{16}$ in. angle along the bottom, at each side of the arch opening. Finally, or if you have a bit of brass tube 1 in. bore, they can be turned, same as I turned round frames for *Jeanie Deans* amd *Grosvenor*. A paper or card template can be used to get the arch-shaped opening for the boiler O.K., as described above.

Be careful about what my one and only niece would have called the "bendification job" in her schoolgirl days. The two sides are bent at right-angles to the front, and must be parallel. The bottom tags are bent inwards at right-angles,



Cab front and sides "in the flat"

do the "glazing." Cut two pieces of thin mica, or perspex, to the size of the window frames; place these over the window openings—inside or outside, just as you prefer—and put the frames over them, riveting through the lot with pieces of domestic pins for rivets. Alternatively, 12-B.A. round-head screws could be used, put through clearing holes in the window frames, into tapped holes in the weatherboard. The completed weatherboard is attached to the tops of the side tanks, at $1\frac{5}{8}$ in. from the rear end of the tanks by 8-B.A. screws run through clearing holes (No. 43 drill) in the angles, into tapped holes in the tank tops, at the point where the angles are fixed inside the tank. This gives a double-thickness hold for the screw threads. Alternatively, instead of using pieces of angle along the bottom of the weatherboard, the sides could be made $\frac{1}{4}$ in. longer, and bent over at right-angles, as shown for the cab used with the larger-boilered engine.

Cab

The cab would appear to be more complicated than a weatherboard, but it is just as easy, as the whole lot—sides, front, and extension pieces for fixing—can be made in one piece. Sheet metal of 18 or 20 gauge is thick enough for this. The whole outline, with dimensions, is shown in the accompanying illustration. Mark it out carefully, and cut to outline; the exact curve of the cab sides doesn't matter, as long as they are both alike. If you have any big drills, the window openings can be drilled, using a small pilot first, say about $\frac{3}{16}$ in., and finishing with a $\frac{7}{8}$-in. drill. It will be a miracle if this drill finishes the hole plumb in the middle of the marked circle, so the humble but necessary half-round file may be used to true the hole and put the finishing touches. Make two window frames as described above; and the upper tags are bent inwards at an angle to suit the curved cab front. The end-on view showing how the cab is attached to the tank tops, should make this quite clear. After bending, try the whole issue in place, and if any adjustments have to be made—some folk fall down over bending; why, goodness only knows!—make them right away. All the bends can easily be made in the bench vice, by putting the metal in with the marked line showing at the jaw tops, and using a piece of hard wood as a buffer between the hammer and the metal. "All right for a biff?" "Indubitably, Buff!" as the British Railways advertisements would put it!

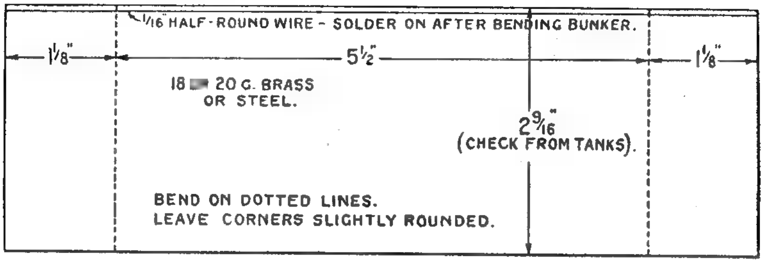
Fit mica or perspex windows in exactly the same way as described for the square ones in the weatherboard, then erect the cab on the tank tops. Drill a couple of No. 40 holes in each bottom angle, about $\frac{1}{4}$ in. or so from the ends, then put the cab in place with the lower end of the side sheets about $\frac{1}{16}$ in. from the rear edge of the tank tops; see illustration. The screws nearest to the cab front can be tapped into the tank tops, but those at the rear end should be nutted, as shown, as the metal is thin and narrow here. Just continue the No. 40 hole through the tank top, and put the screw in as shown. Hexagon-headed screws may be used if preferred.

A piece of metal $2\frac{1}{4}$ in. wide, and a wee bit over $5\frac{1}{2}$ in. long, will be needed for the cab roof. Bend this to the same radius as the top of the cab front sheet, and round off the corners, as sharp corners are prone to take bits of skin off your fingers at the slightest provocation. Drill four No. 43 holes, two at each side, about $\frac{3}{16}$ in. from the edge, in the position indicated in the side view of the cab erected; countersink them. Larger screws than 8-B.A. may be used if desired, but those shown are neater. Put the cab top in place, getting it nicely central, and in close contact

with the curved top of the cab front, and temporarily fix it with [redacted] couple of small cramps, whilst you put the No. 43 drill through the bent-over angles, using the holes in the cab roof [redacted] guide. Secure with countersunk screws, nutted underneath, [redacted] shown.

I haven't shown any beading to the cab edges, " for the sake of simplicity " as [redacted] famous catalogue always points out ; but if any builder would prefer [redacted] beaded edge, simply solder on [redacted] piece of half-round wire, level with the curved edge.

of metallic pimples, applies also in the present instance. Then finally attach the bunker to the running-boards by 3/32-in. or 7-B.A. screws. The two at the sides, can be put through clearing holes drilled through the running-board, and nutted underneath. The angle along the back of the bunker comes over the back buffer beam, so the screws at the back may be screwed into tapped holes in this. Use [redacted] extension drill (previously described) to put through the screw-holes in the angle, and make countersinks on



Bunker "in the flat"

This will give [redacted] similar appearance to the beading around the bunker.

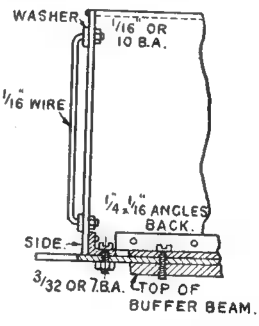
Bunker

This ought to be spelt " bunkum," as it doesn't carry any coal ! To make it, you'll need a piece of sheet brass or steel, 18 or 20 gauge, $7\frac{3}{4}$ in. long and $2\frac{9}{16}$ in. wide. Bend it at right-angles, as indicated by the dotted lines, at $1\frac{1}{8}$ in. from each end ; it looks better if the corners are left rounded. Solder a piece of half-round wire, $\frac{1}{16}$ in. or 3/32 in., just as you fancy, all along the top edge. For jobs like this, I use three or four little toolmaker's cramps, made from $\frac{1}{2}$ in. square brass rod, with $\frac{1}{8}$-in. commercial screws. They only take [redacted] few minutes to make, and are mighty handy. Brass is used, to prevent rusting up when splashed with soldering fluid, and also when washing off a job with the cramps still attached. I have already explained how to make these cramps, in the earlier instalment of this serial. The wire is placed in position, and held by the cramps, one at each end, and a couple more at what certain folk would call " strategic points along the route." Solder the wire, in the ordinary way, to the bunker sheet between the cramps, and be sparing with the solder, so [redacted] to keep the job neat ; also keep the solder clear of the cramps. Then remove them, and solder the places which they covered. Any solder showing beyond the beading, can easily be removed by aid of a square-ended scraper, made from [redacted] small flat file which has outgrown its legitimate job by virtue of Anno Domini. Grind the end off square, and grind the teeth—or what is left of them—away [redacted] each side of the ground end. You won't need any instruction on how to use this useful gadget, but don't use it without [redacted] handle !

Rivet [redacted] length of $\frac{1}{4}$ in. × $\frac{1}{16}$ in. angle along the bottom, at the back, and [redacted] shorter piece at each side ; the note previously addressed to lovers

the footplate ; drill these No. 48, clean through footplate and top of back buffer beam, finally tapping 3/32 in. or 7 B.A.

Before permanently erecting the bunker, fit the grab rails. These are simply pieces of $\frac{1}{16}$-in. or 16-gauge wire, nickel-bronze for preference, about $2\frac{5}{8}$ in. long. Bend over about $\frac{5}{16}$ in. of each end, at right-angles, and screw the bends a full $\frac{3}{16}$ in., with either $\frac{1}{16}$-in. or 10-B.A. die.



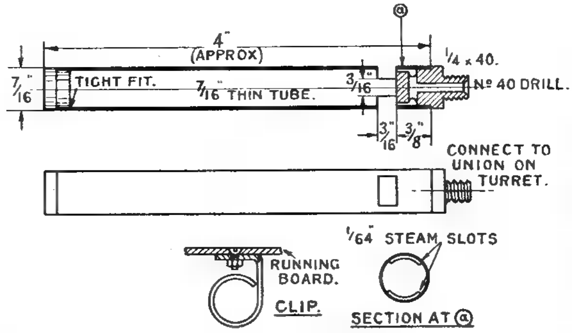
How to fix bunker

Screw [redacted] tapped washer [redacted] to each, or solder on a plain washer, which you like. Drill two No. 50 holes at 2 in. centres, about $\frac{3}{16}$ in. from the edge of the bunker ; make sure the upper one is exactly above the lower, so that the grab rail will be vertical. Put the screwed ends of the rail through the holes, and secure with commercial nuts. Fit similar grab rails to the back ends of the tank sheets. The bunker can then be erected, and screwed down.

Whistle

The whistle is of the organ-pipe pattern with a double slot, which is the next best thing to [redacted]

regular bell whistle. In these small whistles, the trouble is to keep [redacted] " bell " type tube in line with the annular steam slot, without using an outsize spindle. In the whistle shown, two slots are used in place of a complete circular opening ; and the metal between the ends of the slots, keeps the lot in line. The tube, $\frac{7}{16}$ in. diameter and 4 in. long, is squared off at each end in the lathe ; at $\frac{3}{8}$ in. from one end, make two scratches, $\frac{3}{16}$ in. apart, right around it, using a pointed tool. File the slots between these scratches, leaving $\frac{3}{16}$ in. of metal between, as shown in the illustration.



Details of whistle

The front end is closed by a simple plug turned from $\frac{7}{16}$-in. brass rod. For the rear end fitting, chuck the $\frac{7}{16}$ in. rod again ; face, centre deeply, turn down $\frac{1}{4}$ in. length to $\frac{1}{4}$ in. diameter, screw $\frac{1}{4}$ in. × 40, and part off at $\frac{1}{2}$ in. from the shoulder. Rechuck the other way around, in a tapped bush held in three jaw, and turn $\frac{3}{8}$ in. length to [redacted] tight push fit in the tube. At $\frac{1}{8}$ in. from the end, turn a groove $\frac{1}{8}$ in. wide and about $\frac{1}{8}$ in. deep. Drill [redacted] No. 40 hole right across this, and drill another similar hole up the centre of the union screw to meet it. File away [redacted] portion of the flange [redacted] each side, to form steam slots, [redacted] shown in the end view of the fitting [redacted] then press this into the whistle tube, with the steam slots opposite the " noise openings," so that steam issuing from the slots blows across them.

To erect the whistle, make two clips from strips of 20-gauge brass, $\frac{1}{4}$ in. wide, [redacted] shown in the illustration, which needs no description ; put them on the whistle tube, and attach to the underside of the right-hand running-board by means of nutted screws, [redacted] shown. The union is connected to the union screw nearest the whistle-handle on the turret, by a $\frac{1}{8}$-in. pipe, with union nuts and cones on each end, which you can make, by this time, without further detailed instructions. The pipe comes down by the side of the wrapper, as shown in the backhead illustrations, passes through the running-board, and is bent around to meet the union screw on the whistle.

Another Unusual Model

(Continued from page 39)

The angle-iron used in the making of the original scaled down to $\frac{7}{16}$ in. × $\frac{7}{16}$ in. × $\frac{1}{16}$ in. and the straight runs in the model were made by milling $\frac{1}{16}$ in. off the webs of $\frac{1}{2}$ in. × $\frac{1}{2}$ in. × $\frac{1}{8}$ in. mild-steel channel, but I was unable to obtain sufficient of this to make the curved pieces round the outer shell ends and for the tar pan itself. So, here, fabrication was resorted to, the necessary pieces being shaped from $\frac{1}{16}$ in. steel plate and joined by hard-soldering. The end-plates are of 3/32-in. steel plate and the outer casing was formed from $\frac{1}{16}$ in. plate curved to shape round an old mangle roller. The angle is riveted to the casing sheet and bolted to the end-plates with 7-B.A. " M.E." head hexagon bolts, which proved to be correct scale size across the flats.

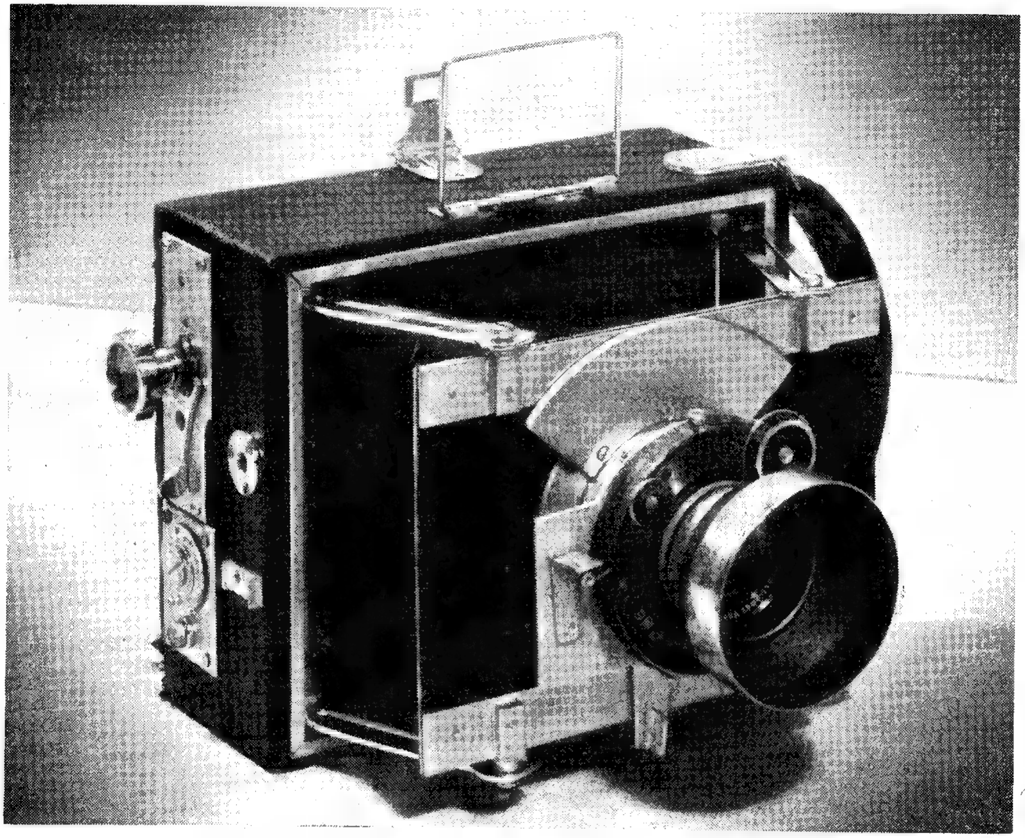
The tar pan [redacted] made up in the same manner, except that in this case the angle is inside and the whole is fastened by 3/32-in. rivets. Out of curiosity, after making the tar pan, I filled it with water and found it to be absolutely leak-proof, much to my surprise. The pan is held in position by angle-iron fastened to the sealing strips (the " shoulders " of the outer casing), the channel at the front and to the rear outer casing plate.

Springs with four leaves each were made up, and the carriers, attached to the outer shell, for same were each fabricated from four pieces of mild-steel joined by hard-soldering—the first took longer to make than the other three put together. The draw-off cock is another piece of building up ; mild-steel for body and cock and brass tubing for the rest. A standard pipe bend, nipple and union suitably altered in shape and provided with flanges for chimney and fixing to casing, form the chimney bend. The chimney hinges down when on the move and is held erect by a simple catch. The lid opens for half its length for filling, which it appears, [redacted] done in the old days by bucket ! The front axle has fittings to take shafts for the horse, but these have not yet been made, [redacted] I am still looking for [redacted] authentic pair to copy.

The model was given [redacted] coat of black under-coating paint and this, combined with the fact that true scale has been adhered to, has, I hope, produced [redacted] model which is unmistakably [redacted] old-time tar boiler. Incidentally, I started to count the 3/32 in. holes drilled in the model but when the total had reached 600 I gave up ! The " time sheet " for the job shows that approximately 200 hours went into its making.

A HOME CONSTRUCTED PRESS CAMERA

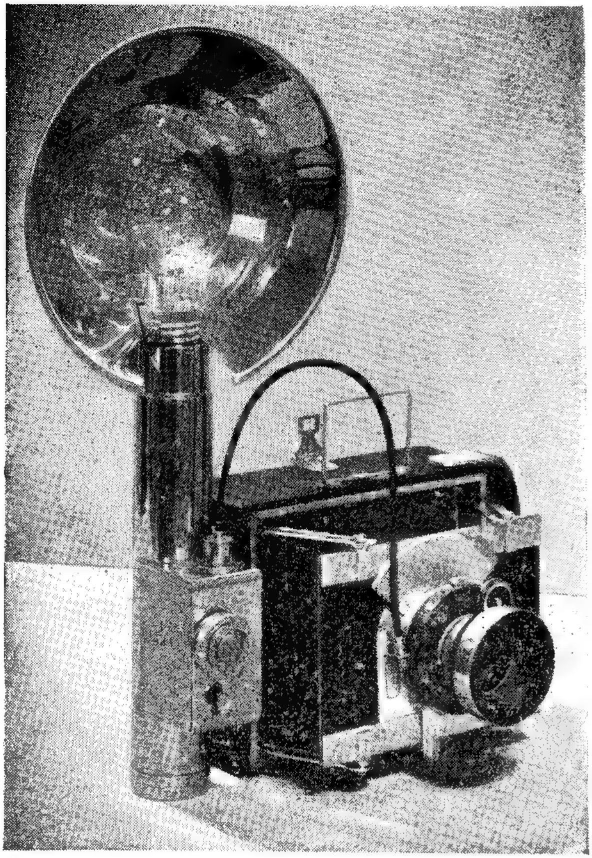
by H. Arthur Clues



JUDGING by the amount of correspondence on the subject, which has recently appeared in THE MODEL ENGINEER, quite a number of readers are interested in camera construction. I thought, therefore, that a brief description of my latest effort in this field would perhaps be of assistance to anyone desiring to build their own camera. Let me point out right away that this type of camera is *not* suitable for general workshop photography and the photographing of models, although, of course, it could tackle certain such jobs.

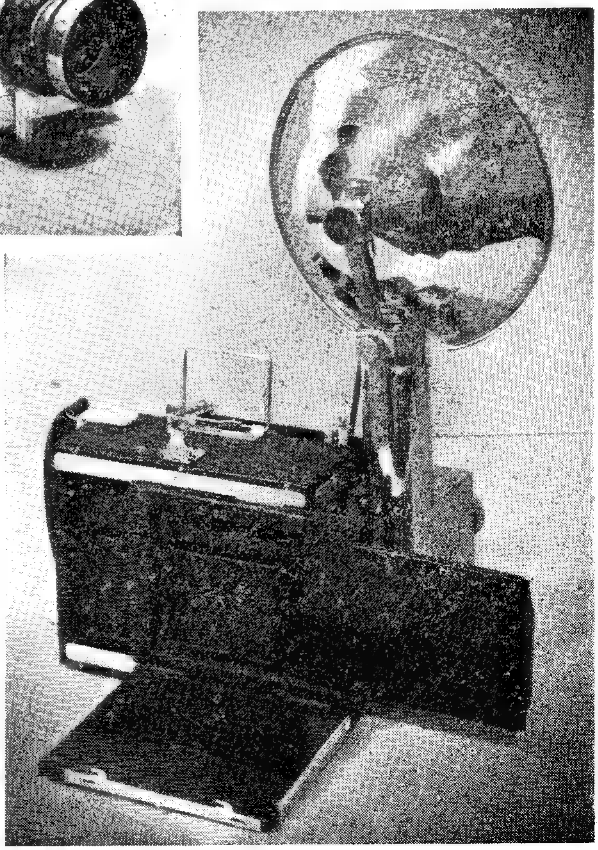
As can be seen from the illustrations it is a press outfit, and, although following conventional lines, I have incorporated in the design certain refinements which I find desirable. The body is made of mahogany, obtained from an ancient half-plate camera which I picked up for a few shillings. The bellows, too, were cut down from the same camera. A search around the "bargain basement" of a photographic store brought to light the parts of a focussing mount, which with a few repairs and alterations was soon in working condition. The gears for the focal plane shutter came from three sources, one was bought commercially, one came from one of my youngster's mechanical toys (he often wonders what happened to his steam roller!), and the other four came from various junk cameras which I make a habit of buying whenever I get the chance. Some of the cover plates, incidentally, came from the same source. The struts were cut from $\frac{1}{16}$ in. half-hard brass plate with hack-saw and file, the slots being milled on the vertical slide of my lathe with an $\frac{1}{8}$ in. end mill. The frame finder used to be a cycle spoke, and the beading on the front of the camera body started its life as part of a curtain rail.

The camera is fitted with interchangeable backs and will take dark slides, size 5×4 in. downwards. The focal plane shutter is of the variable tension, constant slit type, containing



some 12 months ago and has been in constant use since then on other cameras. It consists of ■ spring-loaded plunger, which is set through ■ rack and pinion by turning the large knob shown on the front of the synchroniser. On release, the knob revolves and an adjustable abutment on this knob makes contact with an insulated, spring-loaded plunger, thus firing the bulb. The reflector was not made by me ; it actually forms part of my electronic equipment.

As regards the cost, it is ■ little difficult to say with any accuracy, but, not including the lens and reflector I don't think the raw materials cost more than ■ few shillings. The most expensive item was the chromium plating (both satin finish and bright) which cost £3 3s. But when one considers that a new commercial outfit similar to this would cost in the region of £60 to £100, I don't think one can grumble.



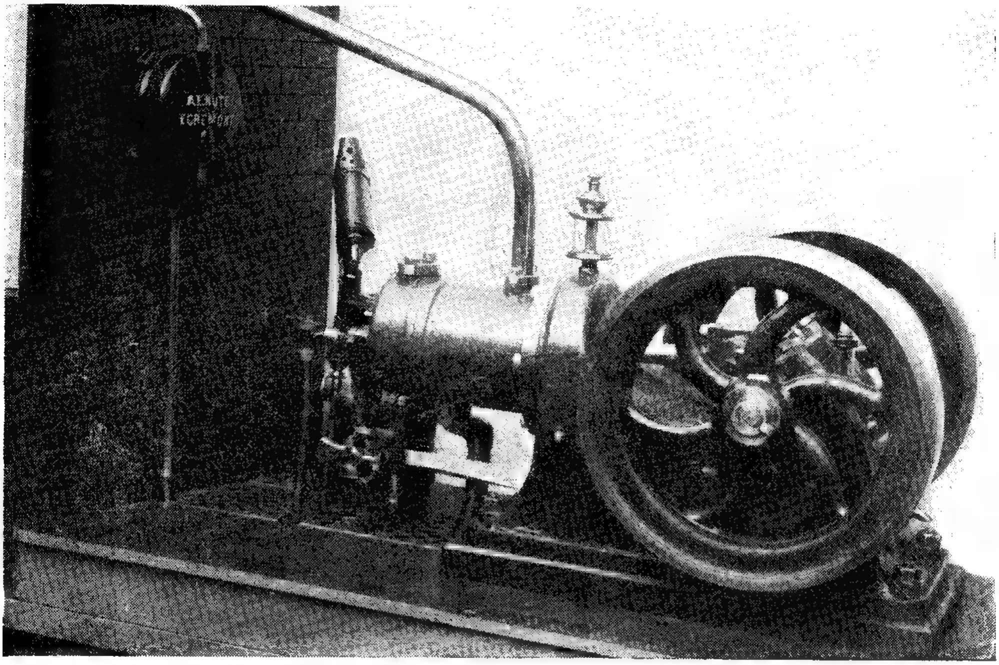
two slit width, one ¼ in. wide and the other 1 in. wide. Three spring tensions give a range of speeds from 1/25 sec. to 1/500 sec. There is also an " open " position when using the between lens shutter. The construction of the shutter is very simple ; it consists essentially of ■ train of gears which imparts a quick wind action to the top roller. A pair of stops prevents the winding or release of more than one slit. By pressing a button on the left-hand side of the camera body, these stops can be disengaged to enable one to pass to the other slit or to the "open" position. A knob and ratchet is fitted to an extension to the bottom roller spindle in order to vary the spring tension.

The focussing scale is carried on the back of the segment plate fixed to the focussing mount and is viewed through an aperture from the sighting position.

The flash gun was completed

A SMALL GAS ENGINE

by A. E. Nute



MANY years ago I made [redacted] steam engine to drive my 4-in. lathe, instead of using the treadle, but after completing it, decided that it would be [redacted] source of trouble and lost time getting up steam before I could make [redacted] start on the work in hand, besides the constant attention to be given to the boiler, keeping the fire going, and the water at the correct level. I decided, therefore, to change over to a gas engine, and so the drawing-board had to come out again.

Being anxious to get on with the pattern-making, no complete drawings were made, the details which were not [redacted] the drawing were "under my hat." When completed, the patterns were taken to [redacted] small iron foundry where quite [redacted] nice job was made of the castings.

The crank and connecting-rod [redacted] forgings and the valve levers are malleable iron. In general outline, the engine looks something like the National gas engine, though I did not use the skew-geared side camshaft, but decided on [redacted] idea of my own to have the cams working in [redacted] oil bath situated under the bearing nearest the front of the photograph. The larger gear wheel on the camshaft can be seen the other side of the flywheel. The inside levers to the cams are cranked to reach over the side of the oil bath to beneath the [redacted]; at the other end they are joined by two short spindles or shafts to the outside levers. The bearing carrying these is bolted inside the body casting.

Attached to the air and gas lever is a "hit-or-miss" governor, and speed can be varied by increasing or releasing the tension spring. The ignition as shown on the photograph is [redacted] single-ended porcelain tube and bunsen burner. I altered it later by putting [redacted] make-and-break on the cam wheel, bored and tapped a hole in the inlet valve cover for a sparking plug, and used [redacted] 4-volt accumulator and coil from [redacted] motor-cycle, plugging up the hole where the tube was previously attached.

The glass lubricator seen between the spokes of the flywheel is fixed to the frame, [redacted] tube leading from it to drop oil into the banjo ring around the crankshaft, the oil being carried by centrifugal force through a short extension to [redacted] hole bored in the centre of the crankpin to oil the big-end. A small lubricator below this carries the oil into the oil bath inside. The small lubricator to the left of the wheel carries the oil to the double bearing for the cam lever shafts, and the larger drip-feed lubricator at the top oils the cylinder. An air intake filter box can just be seen the other side of the valve-rods.

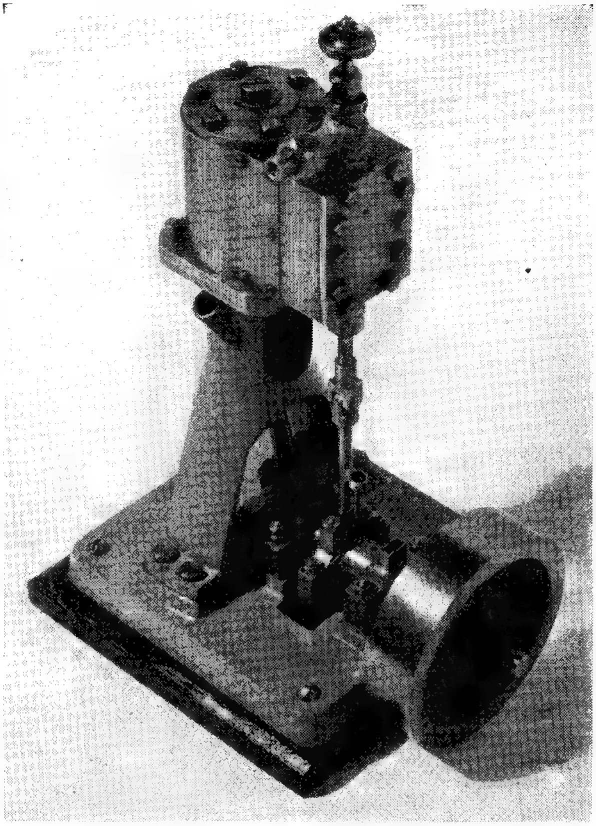
The cylinder is $2\frac{1}{4}$ in. bore, $3\frac{1}{2}$ in. stroke, and the flywheels are $10\frac{1}{4}$ in. dia., weighing about 17 lb. each, with the hollows cast in the rims instead of balance weights cast [redacted] the opposite sides. The patterns and engine were made [redacted] a 4-in. treadle lathe.

(Continued on next page)

A FIRST EFFORT

by R. MOORE, Jnr.

THIS first attempt of mine is not a "great achievement" in my opinion, but several friends suggested that other "first attempters" might be impressed by the fact that it was done on so small a lathe. (A "Lane" $1\frac{3}{8}$ in. Micro.)



The engine was made from a set of castings sold by the Imperia Co., but, as many readers may notice, I have not kept strictly to plan. However, when it was finished, it worked first time on 50 lb. of steam.

Most of the lathe work was done between centres and on mandrels, the only chuck job being the boring of the eccentric strap. The base was faced on the faceplate; the trunk column and cylinder were bored strapped to the cross-slide, and faced and outside turned on a mandrel. The steam chest was faced top and bottom between centres, then the sides were filed, and, clamping it to the cylinder face, the bolt holes were drilled with a hand brace.

The crankshaft was built-up and soft-soldered; the slide valve was also built up, i.e. the exhaust port was made by drilling a hole in the centre of a piece of $\frac{1}{8}$-in. brass, squared up and then silver-soldered to another piece of brass which had been filed to take the slide-valve nut. I found this method much easier than chiselling the exhaust port out of a solid piece of brass!

Machining the flywheel made me say things! It was cast-iron, and the slowest speed I could get was around 350 r.p.m.; consequently, I had to pause every few minutes to sharpen the tool and let the job cool down.

All this machining took place in the radio office of a ship. The lathe and an *ex*-W.D. $\frac{1}{2}$ h.p. 3,800 r.p.m., d.c. motor (the only one I could get at the time) were bolted down to an old cupboard door, thus making the job "portable."

Every time I looked at my "set-up" I thought of the various photographs I had seen in THE MODEL ENGINEER; of the smartly laid-out work-benches, and compared them with mine. Swarf all over the place; pieces of scrap metal and tools littered about, half-eaten sandwiches, empty tea cups and oil spattered over the front of my radio.

In closing, I would like to thank our second engineer, Mr. Gordon, a model engineer of long standing, who gave me many hints on lathe work—and the stop-valve seen in the photograph.

A Small Gas Engine

(*Continued from previous page*)

The main body proved the most difficult machining job for the size of the lathe, but was overcome by setting it upside down for boring and facing the target end to receive the liner and water jacket flange.

The engine was made about 48 years ago, but at the time my workshop was in such a position that I could not use it. Ten years later, however, I had an outdoor workshop and it was put to work, and gave good service driving the lathe it was built on, and afterwards a $4\frac{1}{2}$-in. Milnes universal lathe. I used it for 20 years, then replaced it with a 1 h.p. electric motor, as I was increasing the load by the addition of a double-ended emery grinder. It gave no trouble when in use, and is still in good condition.

WORK-BENCH AIDS

by S. F. Weston

THE ideas described and illustrated in the following notes may be helpful. All of them have been in use for years and have proved their worth.

Every amateur, who is in the habit of working in metal, must, at times, use heat, and a bunsen burner is so useful that it is almost indispensable to him for soldering, sweating, annealing, tempering, etc.

Fig. No. 1 shows an arrangement for attaching instantly to the column of such a burner for holding a soldering-iron in position for heating. The copper bit of the iron should be arranged in the hottest part of the flame, i.e. at the top of the light blue small central flame.

To construct the apparatus two clips are made, from $\frac{1}{16}$ in. by $\frac{1}{4}$ in. brass strip, to embrace the brass tube of the burner, one at the top, and one at the base, the latter to be kept quite clear of the air inlets to the burner. The clips are connected together by a piece of light $\frac{1}{4}$ in. brass tube, each end of which is annealed and flattened out. Two No. 4 B.A. bolts complete the arrangement.

The clips should fit neatly, but not tightly, the top clip has long ends which are set to form a fork to hold the soldering-iron. The handle of the iron rests in a shaped block screwed to the bench. By a little adjustment of the block and the top clip, the copper bit can be easily brought into the correct position in the flame. A second similar block fixed to the bench, nearer the burner, will accommodate the smaller and shaped soldering-irons.

Fig. No. 2 shows a means of accommodating a small lead ladle over the flame. It is quite simple and consists of a wooden upright, about 2 in. by $\frac{3}{4}$ in. in section, provided at the bottom end with two $\frac{3}{8}$ in. diameter dowels which register with two holes made in the bench. The top of the upright is formed at an angle and a strip of wood about 4 in. long by 1 in. wide and $\frac{3}{8}$ in. thick is attached by wood screws. The angle of this must be such that the bowl of the ladle is level when in position, and the height must be so adjusted that the bottom of the bowl is in the right position in the flame. A small channel-shaped clip, screwed on, keeps the ladle straight. The hole at the end of the ladle handle engages with a wooden pintle to anchor the ladle. If there is a tendency for the handle to slip up off the pintle when the bowl is heavily laden, make a saw cut in the pintle and press in a small strip of brass, or other metal.

Fig. No. 3 shows a small mushroom-shaped cap which is simply dropped into the tube of the burner when not in use. This keeps out the dust, and if the air-adjusting sleeve is screwed up over the air intake holes no dust can enter. Nevertheless, the burner should be cleaned up occasionally, care being taken not to enlarge the gas vent.

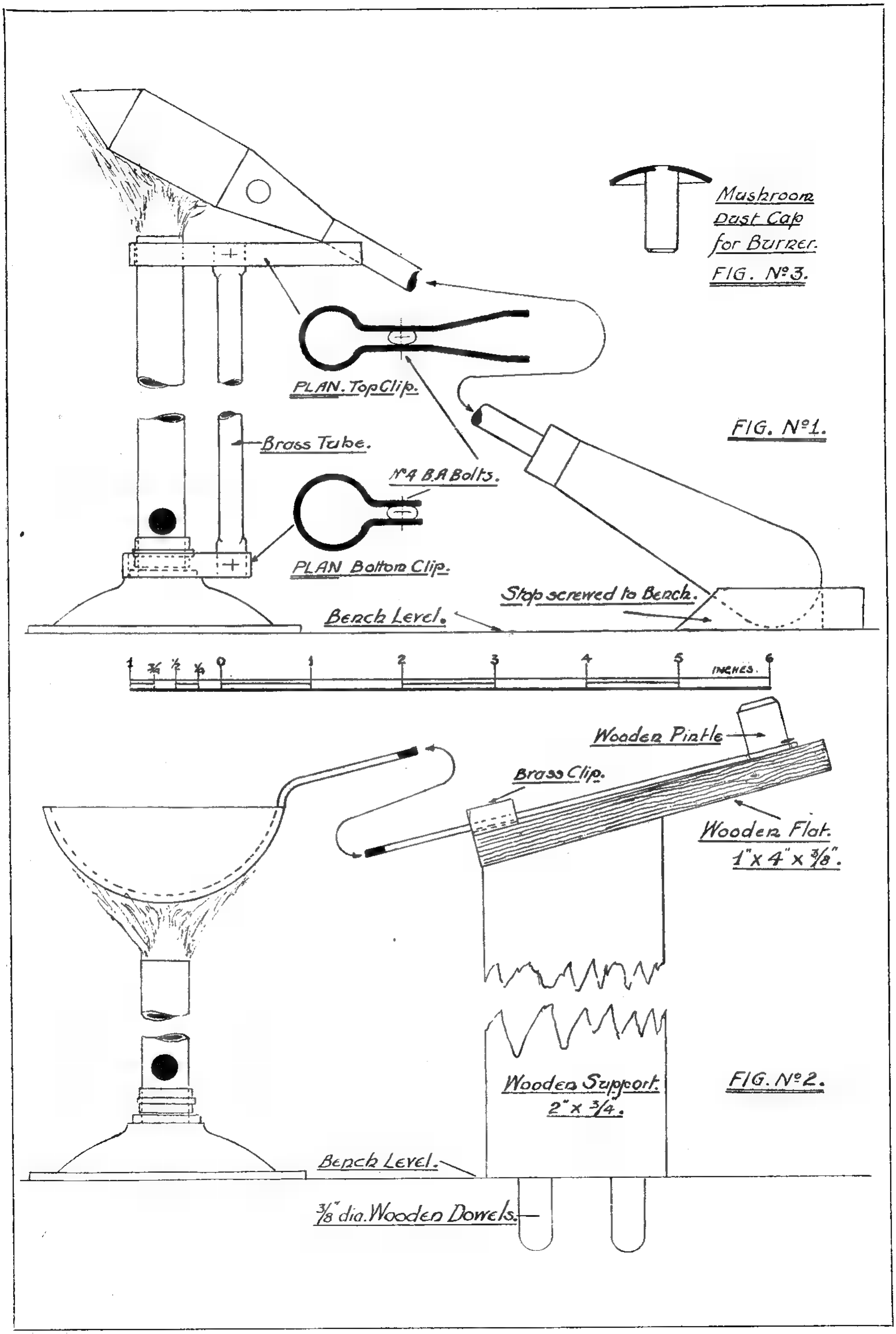
Another suggestion (not illustrated) is to suspend, about 3 ft. 6 in. above the burner, a sheet of wire gauze horizontally, in a light frame. This is useful for supporting any light work which requires drying off quickly.

We now come to Fig. No. 4. This indicates a very simple, but at the same time most useful adjunct for bending small pieces of plate and also, for filing up thin metal. It comprises a block of hard wood, about [illegible] in. long by 1 in. thick and 2 in. wide, planed up true and square. Along one side a brass angle $\frac{3}{8}$ in. by 1 in. by $\frac{1}{16}$ in. is attached by countersunk wood screws. Against the opposite edge a similar angle is screwed on, but with No. 4 round-head brass wood screws. On slackening the last-named screws back and retightening, the work can be gripped between the wood block and the angle. To facilitate the tightening up of these screws and to obviate the use of a screwdriver, short pieces of $\frac{1}{8}$-in. brass rod are soldered to the round heads of the screws, after the slots have been opened out somewhat with a small rat-tail file. When the work is thus gripped, it can be adjusted by lightly tapping until the scribed line for bending is exactly against the edge of the angle. The adjustment can be accurately done by this means, as the work can be brought right under the lamp or window. When so adjusted, it is gripped up hard in the vice and the bending done by pressure with a block of wood.

A thin piece of metal, similarly gripped, with the edge low down near the angle can be filed up safely if a little care is exercised.

It was required to drill a number of $\frac{1}{16}$ in. holes on a piece of work. The work had to be done using a heavy reciprocating drill. As may be imagined, the result was that the work went slowly, as no pressure to speak of could be applied, and a number of drills were broken. To overcome this annoying and expensive difficulty, a piece of $\frac{1}{16}$ in. bore by $\frac{1}{8}$ in. outside diameter tube was cut about $\frac{3}{8}$ in. shorter than the length of the $\frac{1}{16}$-in. drill. At one end a saw cut was made with a metal-piercing saw across the diameter and about $\frac{1}{2}$ in. down the length of the tube. The other end was bevelled. The drill was gently run through the tube to make a neat fit, the saw cut being at the plain shank of the drill. In this position the drill and tube were put in the drill chuck. When the jaws were closed in, the saw cut compressed, and the drill was gripped, whilst the tube formed a sufficient support to prevent the drill bending and breaking and, at the same time, allowed a little pressure to be put on the work. The result was that the work went forward more quickly and not one drill was afterwards bent or brokem. (Fig. No. 5.)

Good lighting is essential for fine work, and it is not always possible to get this if the lamp is in


Mushroom Dust Cap for Burner.
FIG. Nº3.
PLAN. Top Clip.
FIG. Nº1.
Brass Tube.
Nº4 B.A Bolts.
PLAN Bottom Clip.
Stop screwed to Bench.
Bench Level.
1 ¾ ½ ¼ 0 1 2 3 4 5 6
INCHES.
Wooden Pintle
Brass Clip.
Wooden Flat.
1" x 4" x ⅜".
Wooden Support.
2" x ¾.
FIG. Nº2.
Bench Level.
⅜" dia. Wooden Dowels.

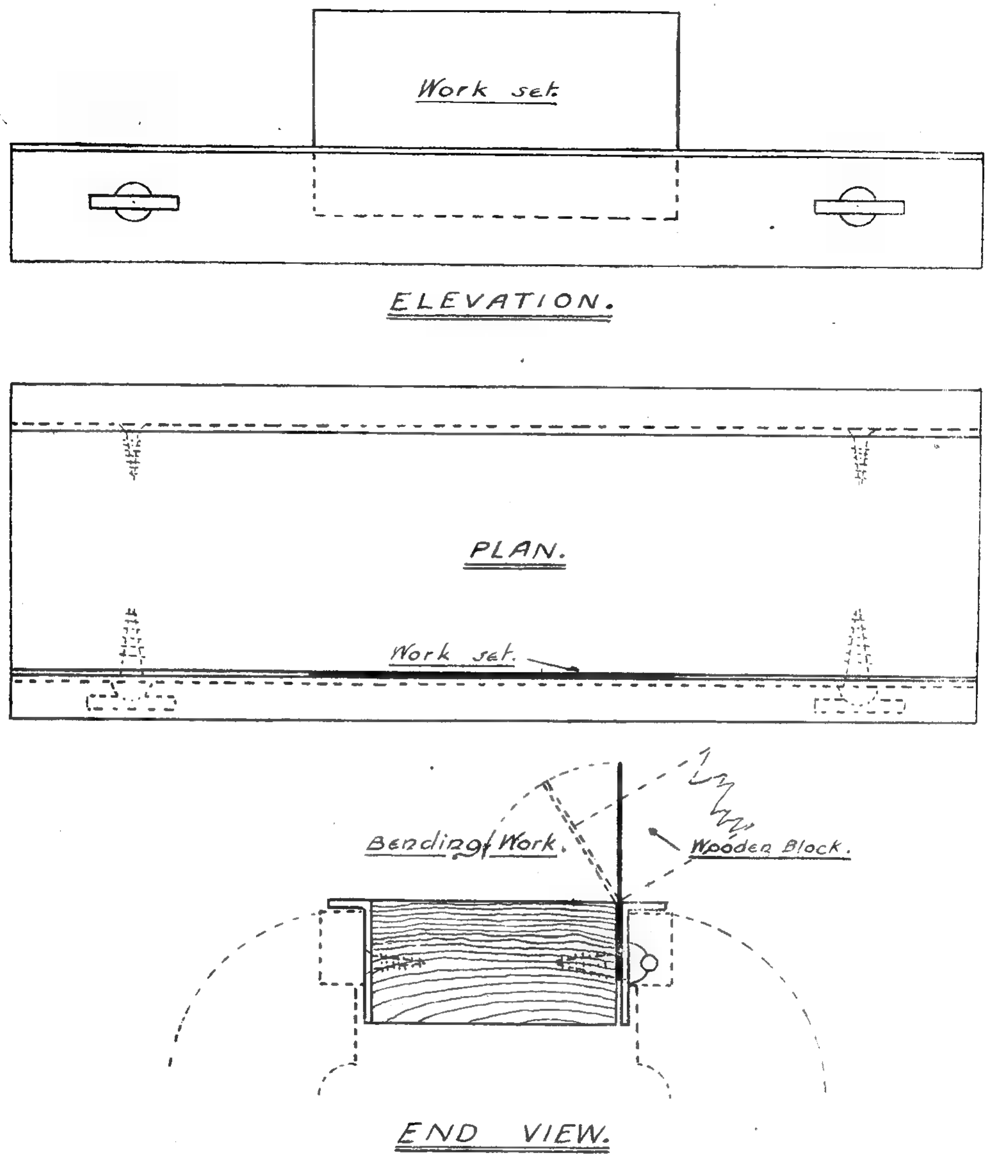


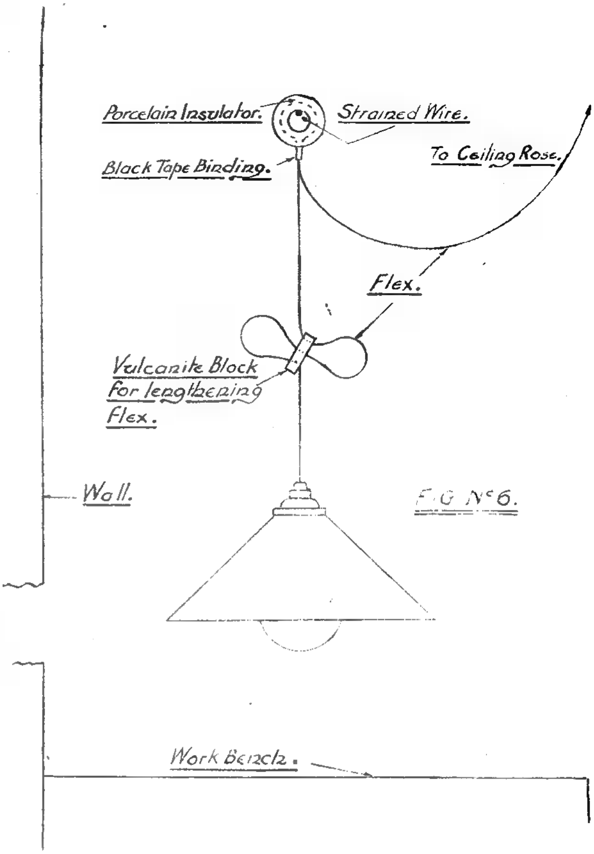
FIG No. 4.

FIG No. 5.

a fixed position. The arrangement shown in Fig. No. 6 allows the light [redacted] be instantly moved to any part of the bench.

A wire (or two wires) is strained above the length of the bench [redacted] the ceiling. To get the wire taut, a loop should be made [redacted] end and if this is twisted by means of two tommy bars, one held and the second rotated, the wire will soon be taut. Before fixing the wire, a porcelain reel insulator should be threaded on same. This can slide freely along the whole length of the strained wire. A sufficiently long length of flex is attached to the ceiling rose, brought to the insulator and looped round same and anchored with [redacted] binding of black sticky tape embracing the two strands of flex. The length of the flex between the insulator and the ceiling rose must be long enough to allow the insulator to slide freely along the wire. The down-hanging portion should be long enough to allow the lamp to be brought beneath the bench, if necessary, so that [redacted] dropped article can readily be found. The slack in this portion of the flex is taken up by means of a wooden or vulcanite cleat, about $\frac{1}{2}$ in. by $\frac{1}{2}$ in. by $1\frac{1}{2}$ in., drilled with three small holes about the diameter of the flex used. This cleat should be threaded as shown in the diagram before the lampholder is fitted.

Such an arrangement of the bench lamp as above described will be found most useful and accommodating. The light can instantly be moved where wanted, and has the advantage that it can be brought down to examine work fixed in the vice, on either side, which cannot be done with [redacted] light fixed in the ordinary way.



Exhibition in Northern Ireland

We have been favoured with a copy of the catalogue of the 1951 exhibition recently held in the Wellington Hall, Belfast, by the Model Engineers' Society (N.I.), and it clearly shows that the show was unquestionably a fine one. There were 22 stands, divided between the ground floor and the balcony of the hall, containing almost everything that a model engineer could hope to see at such a show.

The society was formed in 1944, and its first exhibition was opened to the public, for one day, in 1945.

After this, the society grew and prospered to such [redacted] extent that, in May, 1949, [redacted] second exhibition, the largest of its kind up to that date in Northern Ireland, was opened for [redacted] week, and proved to be very successful, not only to the society but in presenting model engineering to the public of Belfast.

Encouraged by this success, the executive officers put considerable thought and planning, during 1950, into making preparations for the third exhibition and [redacted] are glad to think that another well-deserved success can be recorded.

While all this was going on, plans were being prepared for a permanent passenger-carrying track, and by the kind co-operation of the Belfast Water Commissioners, it was erected on a splendid site at the Antrim Road Waterworks.

At the recent exhibition, eight of the stands were devoted to various branches of the model engineering trade, one to handicrafts, and [redacted] fewer than three to educational exhibits including samples of metalwork, etc., from local and provincial schools and technical colleges. The rest of the stands were devoted to the work of members of the Model Engineers' Society (N.I.), the Belfast Model Flying Club, the Belfast Model Ship Society and the Ulster Model Yacht Club. To us, this seems to have been [redacted] excellent example of friendly collaboration with [redacted] view to presenting a well-varied and comprehensive array to the public, worthy of the Festival of Britain year.

IN THE WORKSHOP

by "Duplex"

No. 93.—A Simple Tapping Machine

As tapping is usually carried out by hand in the small workshop, there must necessarily be some difficulty in keeping the tap truly upright in the work, particularly in thin material that affords but little guidance for the tap. The tap will, however, enter more easily, and will be less liable to be deflected, if the tapping hole is made as large as possible consistent with the formation of a full, or nearly full, thread. In this connection, it may be pointed out that the old-time tapping drill sizes, but little larger than the core diameter of the thread, have, for ordinary constructional work, now been largely replaced by tapping sizes that provide for a thread engagement of only some 75 per cent. of the full thread depth. Nevertheless, when hand-tapping is undertaken, it will generally be found necessary, as the work proceeds, to check the alignment of the tap with a small try-square.

Commercially, machine components and fittings are threaded by using a special tapping machine, or by employing a tapping attachment fitted to the spindle of the drilling machine.

These mechanical tap holders can be adjusted to transmit a torque that will drive the tap to the bottom of a blind hole, but at this stage an automatic withdrawal mechanism comes into action; in addition, a slipping clutch is provided to save the tap from breakage in the event of an overload.

To overcome some of these difficulties, the hand-operated tapping machine illustrated in Fig. 1 was constructed from a discarded drilling machine of $\frac{3}{8}$ in. capacity that has been replaced by one of more modern design; the old machine is, however, quite serviceable and the bearings are unworn.

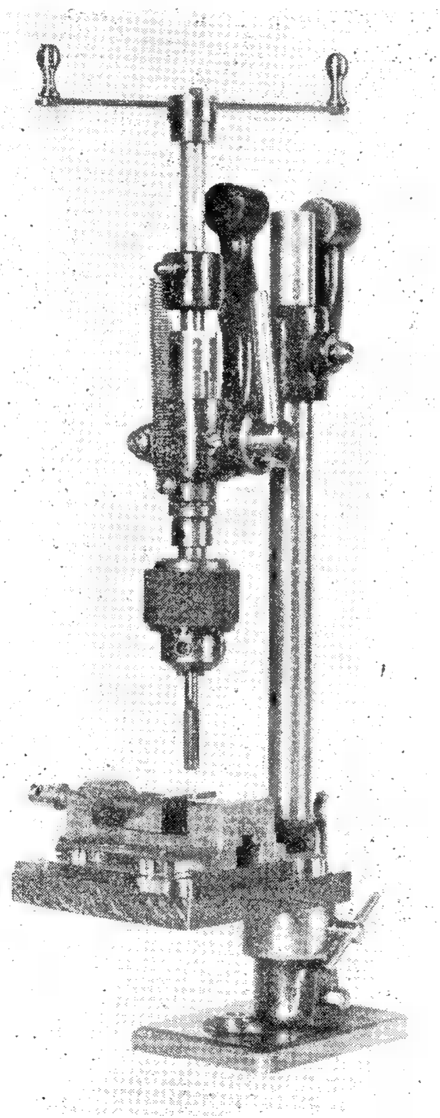
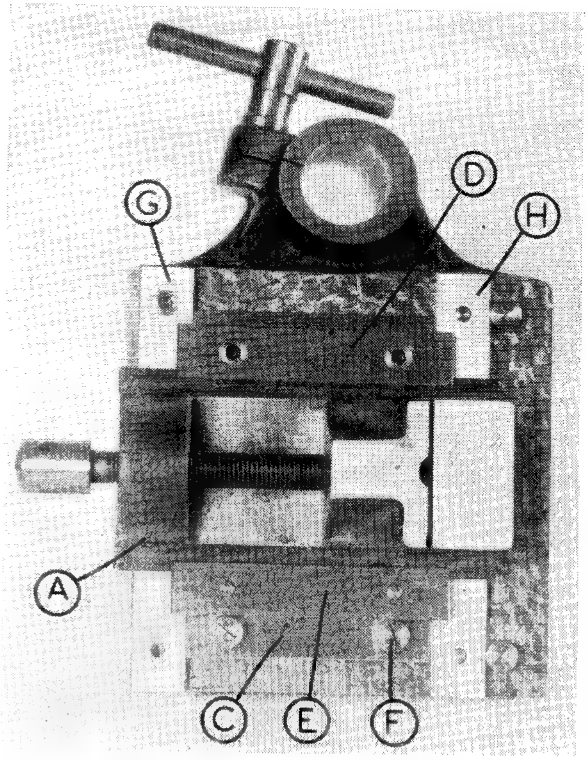


Fig. 1. The complete machine

As will be seen, the bevel pinion driving gear has been removed and an operating handle has been fitted to the upper end of the drill spindle. In addition, the machine vice is mounted on a table with double slides, or jelly-plate, that prevents rotation of the work but, at the same time, allows the tapping hole to align itself freely with the axis of the drill spindle and without throwing any side strain on the taper tap mounted in the drill chuck. By this means, much time is saved when tapping a number of holes in thin material, for the tap can be put right through the work without having to be turned backwards and forwards. Where a large hole of greater depth has to be threaded, it will usually be sufficient to enter the tap for a short distance and then to complete the work in the bench vice, for once the tap has been started truly the alignment can be maintained with ordinary care. The drilling machine feed lever has been shortened, as it is only used to start the tap and, thereafter, the movement of the lever serves to indicate that the tap is entering the work and not merely turning round in the mouth of the hole. As, once the tap has obtained a hold, the two hands are free to turn the handle, the tap can readily be given a to

and fro motion for threading larger or deeper holes.

The depthing gauge, originally fitted to the drilling machine, has been retained, as it is useful for measuring the depth of tapping in blind holes. As the tap is accurately guided, and the jelly-plate mounting for the work eliminates side strain, there is but little danger of breaking even small taps with the sensitive feed employed, for tap breakage is usually the result of applying side pressure. To make sure that the jelly-plate was acting properly, the following test was carried out. A length of $\frac{1}{16}$ in. dia. mild-steel rod was mounted eccentrically in the drill chuck with the aid of a packing strip under one jaw, and the rod was set to project for $\frac{3}{4}$ in. beyond the chuck jaws. Next, a piece of steel bar, drilled with a $\frac{1}{16}$ in. dia. hole was gripped in the machine vice and the tip of the rod was entered in the drilled hole. When the spindle handle was turned, the vice was seen to move with a circular motion and without appreciably bending the test-rod. Moreover, the additional friction caused by downward pressure on the vice



Right—Fig. 2. The machine table. "A"—the vice; "C"—the slide plate; "D" and "E"—the vice slide-bars; "F"—an adjusting button; "G" and "H"—the table slide-bars

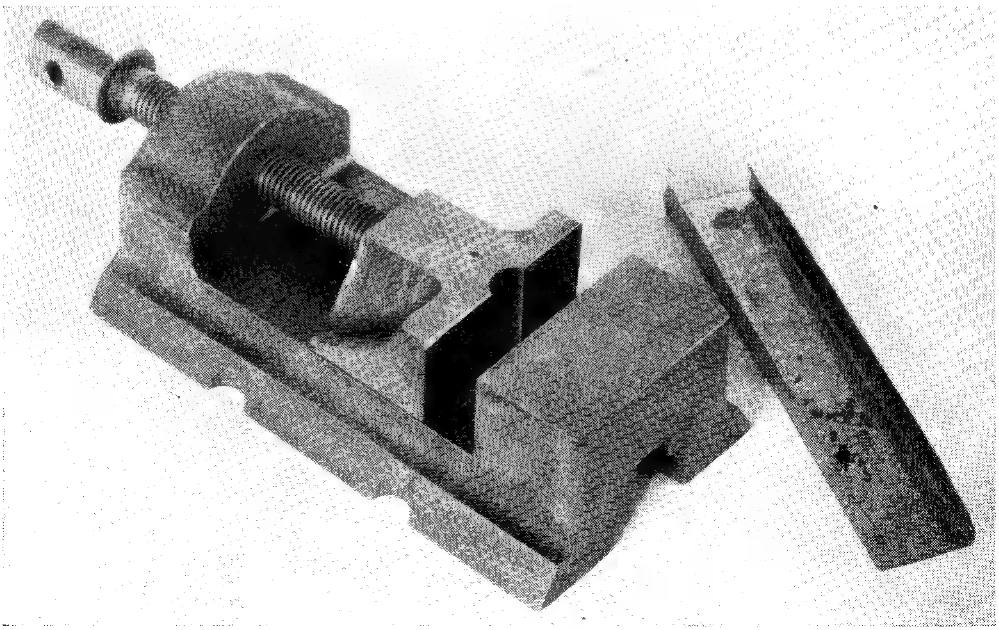


Fig. 3. The modified vice with its chip tray

with the finger did not result in bending the rod. From this it will be clear that quite small taps can safely be used in the machine without danger of breakage by side pressure.

Construction

Although [redacted] hand-operated drilling machine driven by bevel gearing could be used for the purpose, the control of the tap will be more sensitive if the driving handle is attached directly to the drill spindle. The handle illustrated is secured to the spindle by means of two Allen screws engaging in the spindle keyway. Apart from this, the only additional fitting required is the jelly-plate ; this can either be built on to the machine table itself, or the jelly-plate can be made as [redacted] separate unit and then bolted to the table.

As the machine described is used mostly for small work and is fitted with [redacted] Myford machine vice of $1\frac{1}{2}$ in. capacity, the base of the jelly-plate is formed by the drilling machine table.

A start can be made by forming the sliding surfaces on the base of the vice, and the construction is then continued by working from above downwards. The vice slideways can be readily machined parallel and to the correct angle in a small shaping machine, or an angular milling-cutter mounted in the lathe mandrel chuck can be employed ; failing these, the vice can be set up at an angle on the lathe vertical slide and a straight mill or [redacted] fly-cutter is then used for the machining As several more slides have to be machined, it is advisable to plan all the machining operations at the outset so that the correct mating angles [redacted] formed on the work and, in the case up wear. To enable this adjustment to be made, the holes in the slide plate for the heads and shanks of the Allen fixing-screws are drilled $\frac{1}{16}$ in. oversize, and the seatings for the screw-heads [redacted] machined to form [redacted] flat abutment face. To give

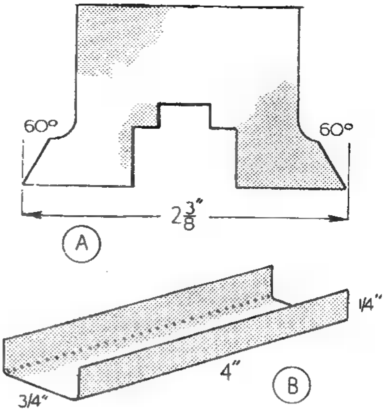


Fig. 4a. The vice and chip tray

additional security, the adjustable slide is held up to its work by means of eccentric buttons, clamped to the slide plate by cheese-head screws and drilled with tommy holes.

In this way, the slide [redacted] be finally adjusted by

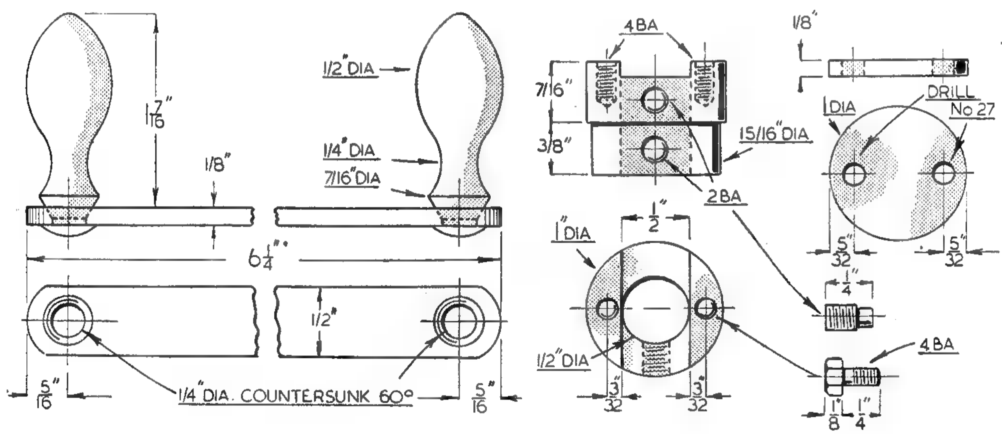


Fig. 4. The handle assembly

of the vice and the slide plate, the slideways are made parallel.

Although there is no need for extreme accuracy in the slide assemblies, these parts must be fitted to work smoothly and freely and, if necessary, the slides should be hand scraped.

As will be seen, one slide bar is fixed to the slide plate with Allen screws, and the other is made adjustable to facilitate fitting and to take turning the buttons and then securing them firmly in place. The best method of fitting the slide bars is, perhaps, first to secure the fixed bar squarely in place with its screws, and then to clamp the adjustable bar in position against the slide plate with toolmaker's clamps. The holes for the fixing-screws [redacted] then be accurately located by making use of the drilled holes in the plate to guide the drill.

The slide plate itself moves in ■ similar pair of slide bars attached to the drilling machine table, but it is advisable to scrape the table surface as well ■ the under side of the slide plate in order to establish even contact.

material, is fitted in the slot on the underside of the vice base; this is to keep chips from falling ■ to the slide plate and interfering with the free-working of the slide.

The strength of the return spring fitted to the

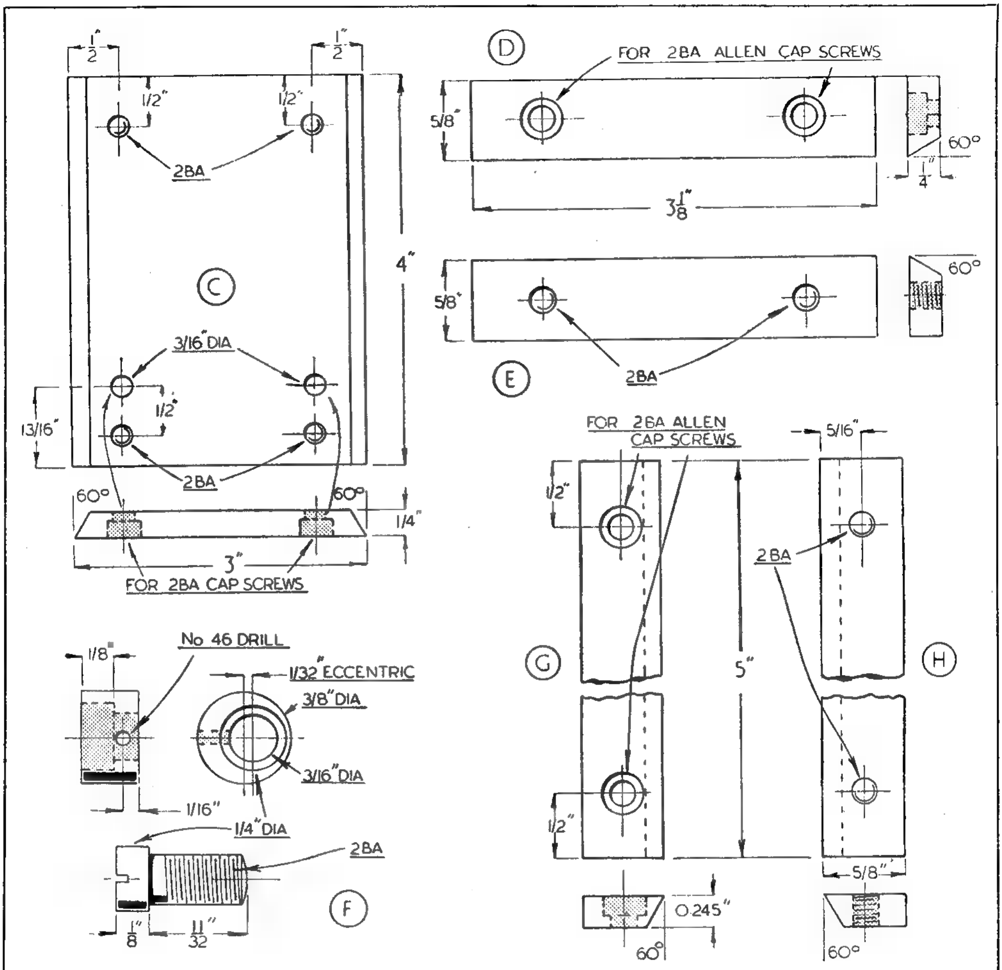


Fig. 5. The reference letters correspond with those in Fig. 2

It should be noted that the slide plate must stand slightly proud of the lower pair of slide bars to enable the vice to slide freely from side to side. When the appliance is in use, the drilling machine table is swung so as to bring the tap over the centre of the vice; no wide range of slide movement is, therefore, needed, except for the purpose of tapping ■ number of holes without shifting the work in the vice. However, if the tap has to be put right through the work, the through-way in the vice base must be kept in line with the tap. A small swarf tray, made of sheet

drilling machine quill should be just sufficient to hold the spindle in place when in the raised position. The sliding clamp collar fitted to the pillar of the machine is a most useful accessory, for it enables the table to be swung from side to side without upsetting the height adjustment or the reading on the depthing scale. The collar illustrated may appear a little clumsy, but it has the merit of being quickly and easily made from ■ standard cast-iron shafting collar. As the drill chuck is subjected to considerable torque, it is advisable to secure this fitting by

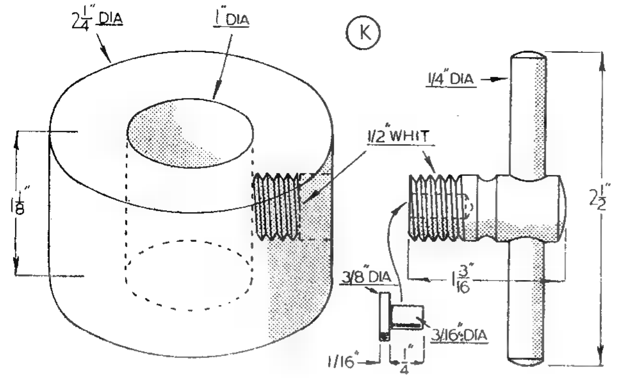


Fig. 6. The table stop-collar

means of an axial screw, engaging in the spindle nose after passing through a clearance hole drilled in the base of the chuck body. When the larger-sized taps are used, there may be some difficulty in keeping them from slipping in the ordinary pattern of three-jaw chuck, and excessive tightening of the jaws should always be avoided to save the chuck from needless damage. To overcome this difficulty, a small driving collar may be used. A flat is first filed or ground on the tap shank at a point a little below the level of the tips of the chuck jaws. The collar is drilled to take the tap shank, and an Allen grub-screw is fitted to engage the flat; next, the upper end of the collar is filed so as to leave a projection or driving-dog to fit between two of the chuck jaws.

As an alternative, the cylindrical collar can be drilled vertically to take a round silver-steel driving peg.

The machine is not, hoever, intended for tapping coarse threads in large holes, but rather as a means of carrying out moderately light work with speed and accuracy.

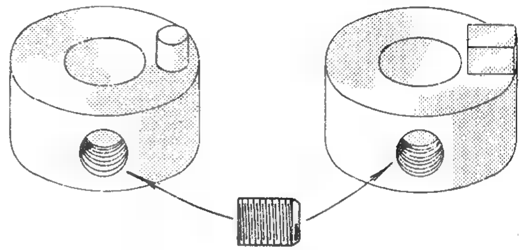


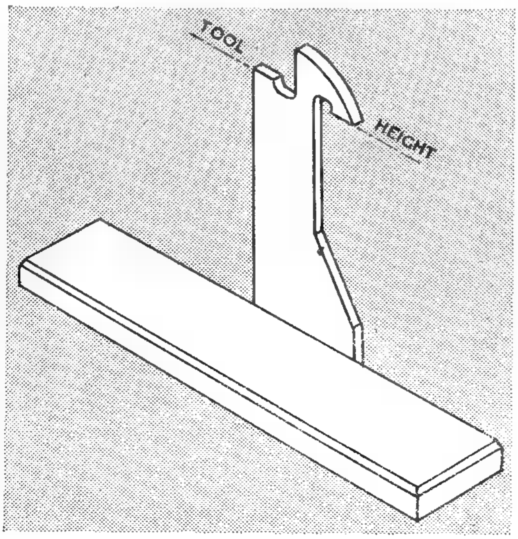
Fig. 7. Clamp-collars for driving the tap

A Lathe Tool Height Gauge

by P. W. Blandford

THE height of a lathe tool is critical if good work is to result, but often its setting is a hit-and-miss affair. If the first cut is to the centre any error in setting will soon be apparent. If there is a centre in the tailstock the tool can be set to that, but if there is already some other apparatus set up there, altering this arrangement for the sake of checking tool height may be a nuisance and in any case is unnecessary work.

For checking tool height without disturbing anything at headstock or tailstock end of the lathe the gauge illustrated makes the job simple and positive. This is, in effect, a fixed surface gauge. Two versions are possible: one to stand on the cross-slide, or a longer one to stand on the bed. As the tool is usually set to overhang the cross-slide the latter may be preferred.



A turned base may be used, as in the simple scribing block, but something able to spread the area of contact across the ways is better. The original had a base made from a length of 1½ in. × ¼ in. bright-drawn mild-steel with the vertical part made from ⅛ in. sheet and screwed to it with three 2-B.A. countersunk screws.

*" That Wonderful Year . . . . . . "

by " The Dominie "

HAVING once more pressed our way through the people who crowd this Crystal Palace, in the year 1851, we can applaud the genius of its designer, Joseph Paxton, sometime gardener's boy who became the bosom friend of his employer, the Duke of Devonshire. Revolutionary in design, and in the mass-production methods used in its building, it has confounded the Dismal Jimmies who prophesied all sorts of calamities for it. But we didn't travel through a century of time to discuss architecture, so let's have a look at some marine engines, shall we?

Here we are—Stand 38—Maudslay, Sons & Field, of Lambeth : a name to conjure with at this period. From the point of view of size, the most imposing exhibit is a connecting-rod from " a pair of patent double-cylinder marine engines, of the collective nominal power of 800 horses," which rod, as the catalogue tells us further " gives a forcible impression of the power of these stupendous engines."

But most of Maudslay's exhibits are models of marine engines, and well worth close inspection, too. First of all, a pair of direct-acting double-cylinder marine engines, fitted with paddle wheels and feathering floats (Fig. 22). As we see, each pair of cylinders has a kind of tee-piece connecting their piston-rods to a cross-head guided by slides on the sides of and between the cylinders. From the crosshead the connecting-rod drives to its crank on the shaft overhead. The air-pump is also driven from the cross-head *via* rods and rocking-levers.

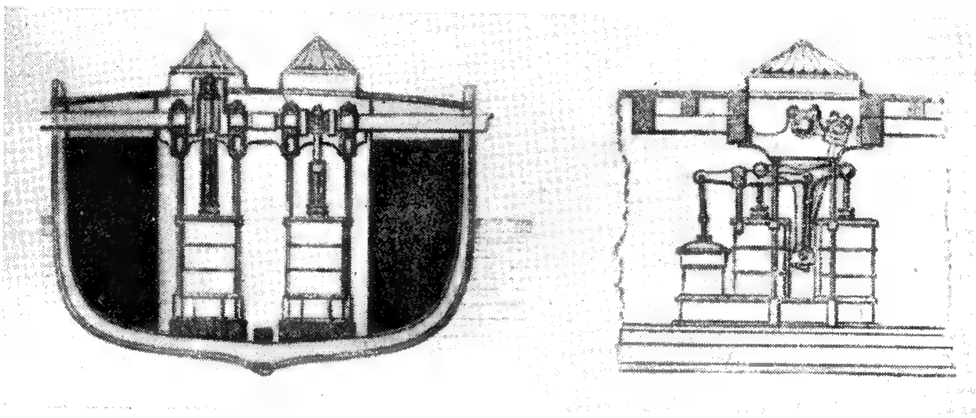


Fig. 22. A pair of Maudslay's double-cylinder marine engines—that is, four cylinders in all. These are the so-called " Siamese " engines

*Continued from page 599, " M.E.," Vol. 104, May 10, 1951.

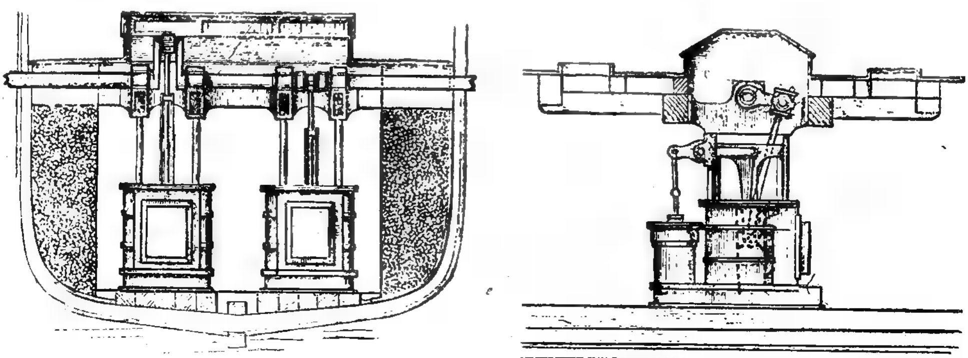


Fig. 23. Patented by Maudslay in 1841, this annular cylinder marine engine is a development of the Siamese engine. More compact, but not so easily built

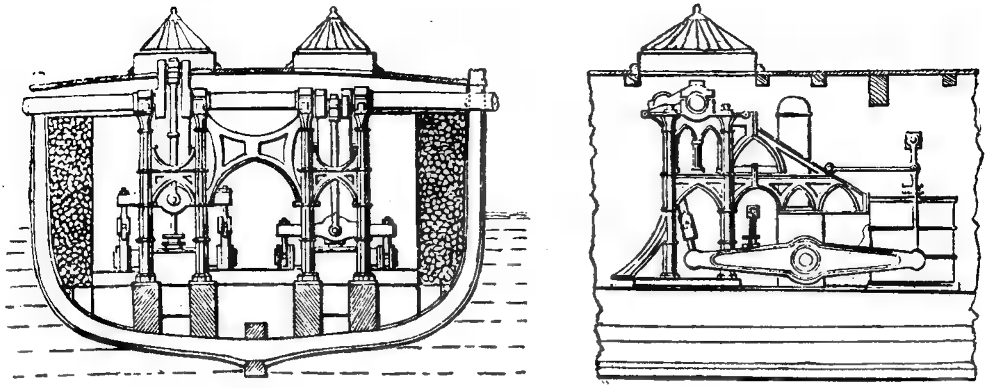


Fig. 24. Originally developed by Boulton & Watt about 1814, the side-lever marine engine was taken up by most makers. Maudslay's is a typical arrangement

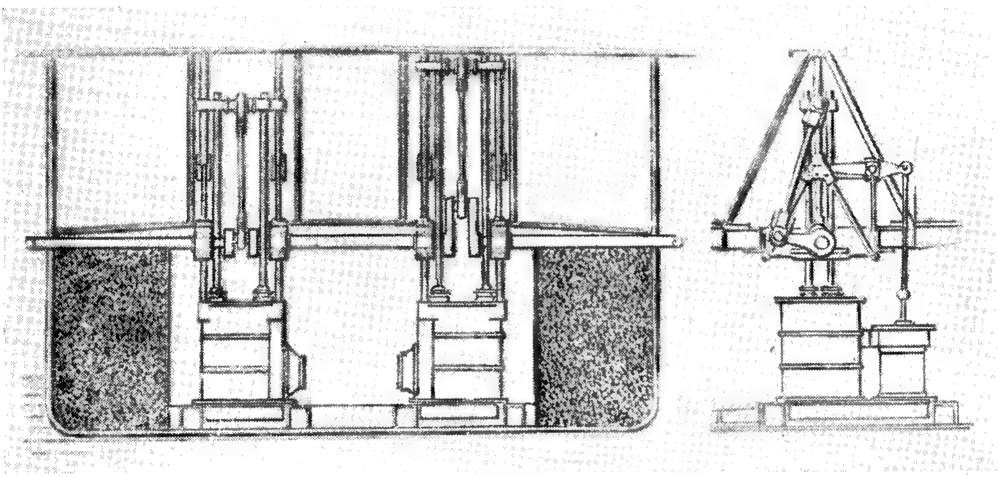


Fig. 25. Steeple engines were originally developed on the Clyde, and were extensively used on other rivers. Maudslay's double piston-rod engine is shown above

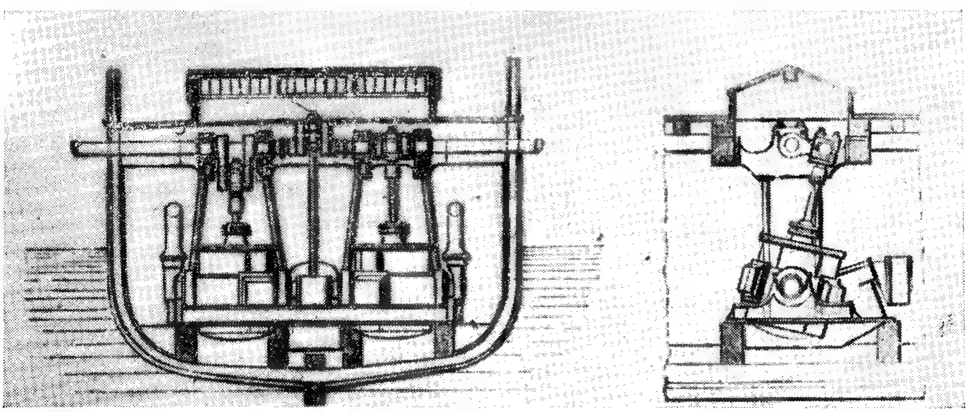


Fig. 26. Joseph Maudslay patented the oscillating marine engine in 1827, and it was to prove very popular after an initial dislike had been overcome. Note valve-chests on sides of cylinders

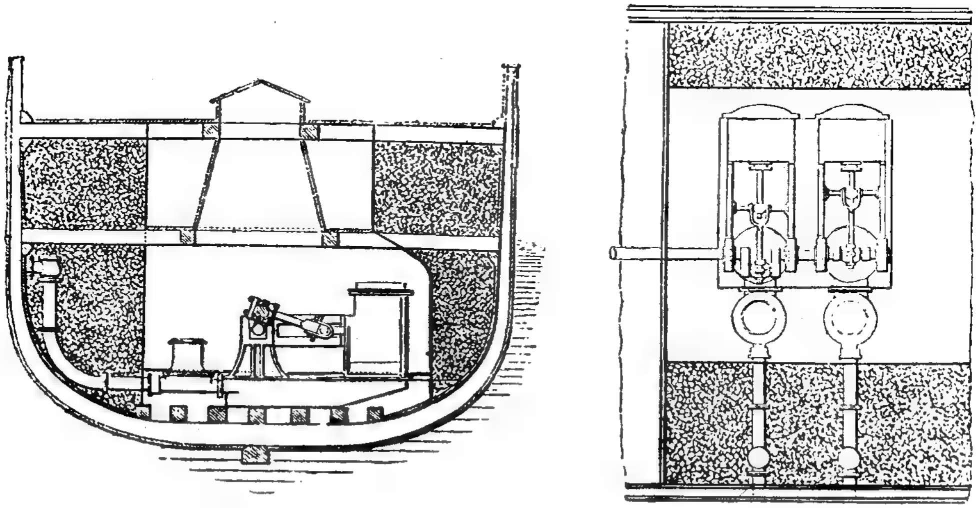


Fig. 27. Maudslay's direct-acting screw engines were of large bore with short stroke, to keep the width down. Those of H.M.S. [redacted] Ajax" (1848) worked at 6 lb. per sq. in.

This [redacted] tee-piece idea is used in the Annular Cylinder Marine Engines (Fig. 23), but here the cylinder has [redacted] internal trunk, and the two piston-rods are driven by [redacted] single annular or ring-shaped piston, with the crosshead sliding in the internal trunk of the cylinder.

Fig. 24 shows a pair of Maudslay's "Marine Beam Engines," or Side Lever Engines, which by 1851 have been partly superseded by other types. But they certainly make [redacted] fascinating model—what about it for your next? (If there were sufficient demand, and the Editor were willing, we could even supply detail drawings of one of these!)

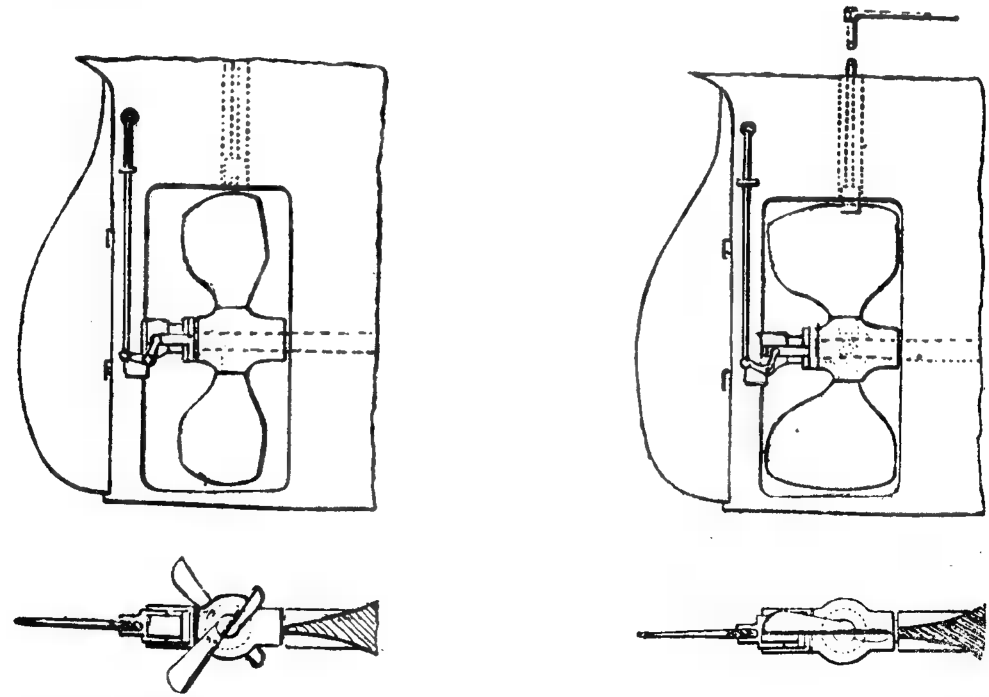


Fig. 28. Maudslay's feathering screw propeller, in which the blades could be rotated so as not to impede the ship's motion when under sail

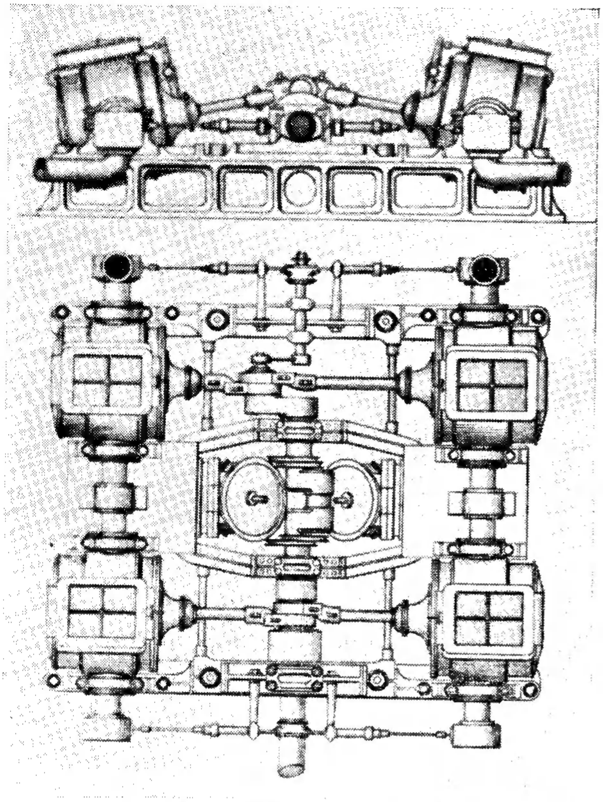


Fig. 29. Watt's four-cylinder oscillating marine engine for screw-propulsion. Note inclined air-pumps driven by central crank

Or perhaps you prefer those "steeple" engines (Fig. 25) for shallow river navigation? Now the twin piston-rods pass each side of the crankshaft, to which the connecting-rod drives downwards. As before, the air-pump is driven by rocking-levers.

Here, too, is a "pair of direct-acting marine steam engines, with oscillating cylinders" (Fig. 26)—a type which hasn't been in use long in 1851, but which is to prove very popular before it dies out. Steam passes through the hollow trunnions on which the cylinders swing, and is controlled by slide-valves in the steam-chests on the cylinder sides. The single air-pump is driven from a third crank in the centre of the paddle-shaft.

Screw propulsion is still not very widely used, but Maudslay's are exhibiting their horizontal direct-acting engines for screw work. These, it is claimed, are "so constructed as to occupy little space, and to be altogether below the waterline"—the later statement, of course, is made with one eye cocked towards the Admiralty. But look at the tremendous angularity of that connecting-rod—there must be a tremendous side-thrust on the cross-head, mustn't there? (Fig. 27.)

What's that? You didn't know they had feathering propellers in 1851? Well, there's the proof in that model, the idea being that when the vessel is proceeding under sail alone, with the engines stopped, the screw can be feathered so that the blades will not impede progress. Saves unshipping the screw and lifting it out of the water, which is another method used in

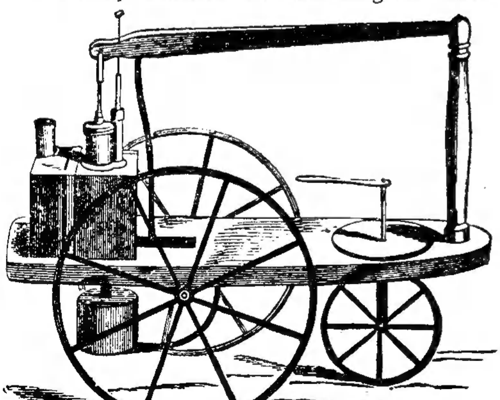


Fig. 30. Model of Watt's "locomotive engine," built by William Murdoch in 1785 at Redruth, Cornwall, and shown at the Crystal Palace in 1851

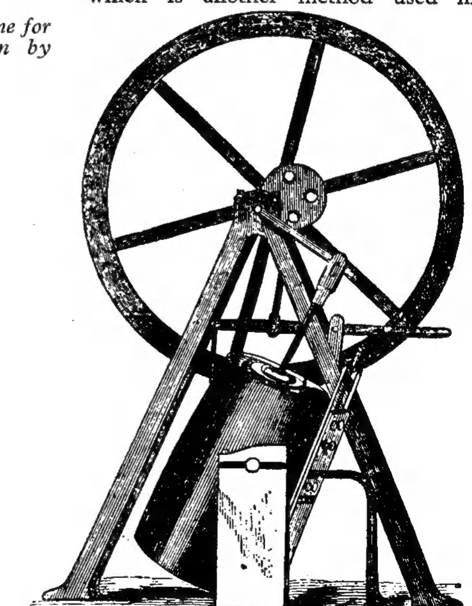


Fig. 31. Model of Watt's oscillating engine, also built by William Murdoch, when in Boulton & Watt's employment

1851. Shipmasters at this era still rely more on sail than on steam, you know!

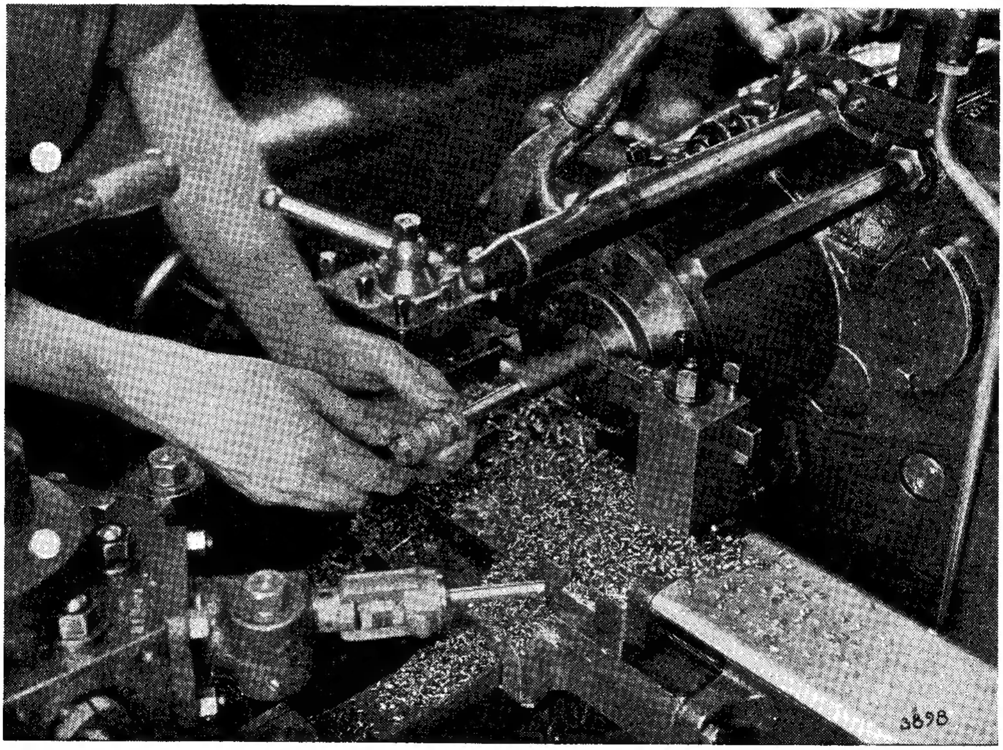
But although it would be very fine to stay longer on Maudslay's stand, watching these beautiful models in motion, we'd better move on, for we have so much to see. James Watt and Co. (formerly Boulton and Watt), have a stand over there, with their latest four-cylinder marine engine (Fig. 29); "for driving the screw propeller by direct action at 65 revolutions per min." The oscillating cylinders are 52 in. diameter, and have a stroke of 3 ft., with the "collective power of 700 horses." Here, too, an eye has been directed at the naval aspect, that being entirely below the water-line, the engines are protected from the effects of shot. There are no torpedoes to think about, of course, in these days!

On this stand are two interesting historical models by William Murdoch (Figs. 30 and 31). The first is the "locomotive engine," built by Murdoch in 1785, and tried by him at Redruth in Cornwall in the celebrated episode of the terrified parson. The second working model is of an oscillating engine, built by him at the same period to illustrate Watt's patent of that principle.

At this time, of course, Murdoch was employed by Boulton and Watt in the construction of their pumping engines in Cornwall, and, later, in the construction and supervision of the Soho works.

(To be continued)

THE OFFEN MICRO BORING BAR



OFFEN & CO. LTD., Kings Mill Lane, South Nutfield, Redhill, Surrey, in addition to their now well-known universal-action positive locking vice, are producing an interesting micro boring bar which can be set to as accurate a degree as 0.0001 in. while still in position on the machine.

The boring bar can cover in a small number of various sizes a wide range of diameters, while the balanced cutter of the double-cutter design, renders machine reaming entirely unnecessary.

The main feature of this new boring bar is the comparatively inexpensive maintenance, since the only wearing parts are the cutters which can be instantly readjusted; they can reasonably be expected to do the work of the several sorts of reams, and their wide application can save an appreciable amount of time and money. They are available with either high-speed steel or tungsten carbide cutters.

The manufacturers will be pleased to furnish further particulars and prices upon request.

PRACTICAL LETTERS

Model Cars and Model Engineering

DEAR SIR,—While I agree there are many model car enthusiasts who do not make their engines or cars, may I put in a plea for those who do?

Could Mr. Clawson explain how he ties up his definition of the aims of THE MODEL ENGINEER with his hope of articles on camera construction? Will these be small scale copies of cameras, or full-size, Mr. Clawson? Is Mr. Westbury's "Minimotor" a model or not, and are clocks and domestic refrigerators models?

Mr. Field made a very fine 10 c.c. o.h.v. petrol engine, and he put it into a scale model of an Alfa, yet this is not "approved" model engineering. One wonders if he would have been accepted as a model engineer if he had put his engine into "a small scale copy of industrial product," such as the hydroplanes on page 763 of issue of June 14th.

Could we please have some articles on *making* model cars, similar to the descriptions of the two "MCN" Specials? I don't think this would turn THE MODEL ENGINEER into "The Model Speedway News," any more than "L.B.S.C.'s" articles have turned it into "The Small Loco-Builder's Weekly."

Yours faithfully,

Nottingham. P. R. WIESE.

Model Locomotive Efficiency

DEAR SIR,—I was very pleased to see Mr. Longthorn's and "Corregis's" replies concerning model locomotive efficiency, and whilst in the main they agree with my original proposal, I feel that whilst pure theoretical efficiency is an ideal, what is really wanted is a simple formula which would be agreed upon and accepted by all clubs as a basis of efficiency for club locomotive trials days, etc. At the moment each club seems to use its own formula, but the results only tell us which locomotive came on top at a particular event. They do not tell us whether a locomotive in the south of England compares favourably or otherwise with one in the north of England. If we had a common basis for comparison we should know, or at least we would have some indication as to our own locomotives' efficiency relative to others. It has been stated that the majority of club locomotive trials are merely social fixtures and not scientific performance trials. Whether this is true or not I do feel that whilst being a social event they can be made instructive and informative, hence my suggestion for a simple but effective formula for such occasions.

Regarding the suggestion of "Corregis" to weigh locomotives to determine the weight of fuel used I think this would be impracticable. A very small difference in the height of water in a large boiler, would make an appreciable difference in weight, whilst in a $2\frac{1}{2}$-in. gauge narrow firebox locomotive the margin would be so fine that it would have to be weighed on fine balances to determine a difference. What of the ashes in the ashpan and smoke box, and the oil in the lubricator? Should not the locomotive be weighed hot in the first place instead of cold? Will not the same volume, i.e., the same glass reading of water, weigh more when cold than when hot?

Mr. Longthorn's suggestion relative to fuel is certainly sound but in these days of nationalisation could we guarantee that we get the type of fuel we would desire? I know I sometimes have difficulty, and most of the coal that I have seen in the north does not compare with soft Welsh.

I rather like the suggestion of putting locomotives into power classes for the reasons given, but apart from the difficulty of determining whether "p" should be the same for all gauges, should engines of the same power classification, but different gauges, be grouped together or segregated into different classes for each gauge.

Summing up, your two correspondents seem to lend support to my original suggestion that in trying to find a formula for the purpose which I have in mind, theoretical tractive effort, i.e., cylinder sizes, etc., should not be taken into account, only the amount of work done and the amount of fuel used.

Yours faithfully,

Birmingham. W. FINCH.

Model Steam Turbines

DEAR SIR,—I was very gratified to find that the fame of my little steam turbine had spread as far as British Columbia and I thank Mr. Blackstaffe most cordially for his suggestions in the issue of June 7th.

By doing some researches into that mine of information, Stodola's book on steam turbines I had come to much the same conclusion; in fact, the calculated losses for an unshrouded, unguarded wheel were too frightful to contemplate.

But my practical difficulties were the same as Mr. Blackstaffe's, namely that a shrunk-on rim, even if high tensile steel, would fly off at the much higher revolutions that I am using. The only solution appeared to be to copy the gas turbines, again by using an unshrouded wheel running with very fine tip clearance inside a fixed case, which, of course, has the same effect as a shroud. For a model, 0.001 in. tip clearance and 0.005 in. side clearance over the inactive portions of the blades, seemed to be called for and the new turbine is made to these dimensions.

Unfortunately I cannot yet report complete success, because at these speeds it is extremely difficult to prevent bearing wear which allows the wheel to tilt and rub the casing, when, of course, all the advantage is more than lost. However, that is mainly a matter of side thrust from the gears and will be attended to in the new gear reduction that I am building. With the new combination I hope that the turbine will enter a new field of both power and reliability, and should it prove to be the case, I would be most happy to give an account to "M.E." readers.

Yours truly,

Sevenoaks. D. H. CHADDOCK.

Efficiency of Model Locomotives

DEAR SIR,—Regarding the letter on the subject in the issue of THE MODEL ENGINEER dated May 3rd last, without entering into a repetition of the arguments that have been published in THE MODEL ENGINEER in the last couple of years, it would seem that the formula offered—$\left(\frac{\text{Load} \times \text{Distance}}{\text{Fuel}}\right)$ does not take into account the possibilities of the different sizes (scale) of the engines. Furthermore it entirely omits the important factor *speed*.

Could not a satisfactory test formula be worked out, and competitions held among locomotive men, similar to those commonly enjoyed by speed-boat and car racers? The results attained would give a general standard to be aimed at by overseas builders such as myself.

Yours faithfully,
C. H. ROBERTS,
Argentina.

The Value of Criticism

DEAR SIR,—May I express my appreciation for the interesting article by "Duplex"—A Die-Holder with Detachable Guides. I am at present engaged in making two of the examples given, and I may say that the step by step instruction and very clear sketches leave nothing to be desired.

I note that Mr. A. S. Hutton of London has expressed dissatisfaction with "Duplex" over an article of theirs which appeared in the May 3rd. issue.

We are all well aware that were it not for our continuous and sharp-pointed criticism of our M.P.'s in general, most of these gentlemen would undoubtedly lapse into a somnolent or comatose state from which it would be difficult to rouse them. Consequently, Mr. Hutton's criticism, whether he is right or wrong, has the effect of keeping the writers "on their toes."

However, let us not be too critical—if we were all honest with ourselves, perhaps there would be little of our work which would bear close scrutiny, and there would be few of us indeed who could say with absolute truth: "Here is a little piece of mechanism I have constructed which is perfect in every detail."

If we are to believe the old adage about two heads being better than one, then it is reasonable to assume that "Duplex's" work is superior in every way to many of the other examples in THE MODEL ENGINEER. Indeed, I find this to be so, and so whole-heartedly I wish them the continued success they deserve.

More power to their elbows, all four of them.

Yours faithrully,
Glasgow. "SCOTIA."

CLUB ANNOUNCEMENTS

York City & District Society of Model Engineers

The next meeting will be held on Saturday, July 21st, in No. 8 room, Co-op Buildings, Railway Street, York, at 7 p.m.; all interested persons are invited.

The track at Bishopthorpe is now in service, with auto-colour signals. Anyone wishing to use same, should communicate with the Hon. Sec. Lone hands specially welcomed.

Hon. Secretary: K. VAREY, 75, Hempland Lane, Heworth, York.

International Radio Controlled Models Society

Entry forms for the *Daily Dispatch* international radio-controlled model boats contest, to be held on the Model Yacht Pond, Fleetwood, Lancs, on August 4th, 5th and 6th, can now be obtained from the Acting Secretary, C. H. LINDSEY, 292, Bramhall Lane South, Bramhall, Stockport, Cheshire.

Falkirk and District Model Engineering Society

We have now completed our railway track and it has been in operation since early this year. It is situated in the grounds of Callendar Estate which is at easy access from the town. The site, we think, is an attractive one and on a summer's day there is no finer surroundings. The track itself is roughly circular and is 400 ft. long. Three gauges are available 2½ in., 3½ in. and 5 in. and the rail is of aluminium alloy, hard drawn to the orthodox section. The whole track is laid on cast concrete arches of pleasing design It is a sporting track and we are assured by our locomotive enthusiasts that it is ideal for club men.

Hon. Secretary: DUNCAN SERVICE, 15, Neilson Street, Falkirk.

Derby Society of Model and Experimental Engineers

We are now occupying new premises at 294, Abbey Street, Derby, the two-storey building being a big improvement from our old H.Q. All members rallied round with the re-decorating and the top floor is now in use for meetings. The ground floor room is to be our workshop and we hope shortly to literally have things humming there.

We have been glad to welcome new members recently, but we still have room for more and extend a sincere welcome to anyone interested in any form of model engineering, to call at the above address and see if they like us! Meetings first Wednesday in each month, 7-15 p.m., together with visits arranged to places of interest.

Our annual exhibition is to be held this year from August 23rd to 25th, and, by way of an experiment, an arts and crafts section is to be included.

Work is progressing with the club locomotive and we hope that "steam trials" will not be long delayed.

Hon. Secretary: G. T. SMITH, 52, Holtlands Drive, Alvaston, Derby.

The Tees-side Society of Model and Experimental Engineers

On Tuesday, July 24th, 1951, members are invited to visit the Cargo Fleet Ironworks, Middlesbrough. Those attending should assemble not later than 7 p.m. at the main entrance in South Bank Road.

A talk is to be given on Tuesday, August 7th, 1951, at the society's headquarters, at 7.15 p.m. The speaker is to be Mr. W. Morgan and his subject is "The Art of Building a Model Boat at Minimum Cost."

Hon. Secretary: J. W. CARTER, 28, East Avenue, Billingham, Co. Durham.

The Kent Model Engineering Society

Until September, the society will be holding its meetings at Crantock Road, and when the Men's Institute resumes for the winter term we shall be using the metalcraft workshop at Brownhill Road School, Catford. Meanwhile, should any locomotive enthusiast, club member or lone hand, care to use the permanent track at Crantock Road at weekends, a note to the secretary will assure them of a welcome.

Hon. Secretary: F. H. GRAY 73, Sangley Road, Catford, S.E.6.